

# Tender

## For

Comprehensive Maintenance & operation of 850kLD MBR based S.T.P. including Effluent treatment tanks, Water softening plant, Inlet tank, pump room, outgoing tank for residential complex installed at  
**AIIMS, Jodhpur.**

N.I.T. No.	AIIMS-JDH/EE/ELECT/2019-20/03
NIT Issue Date	14 <sup>th</sup> June, 2019
Pre Bid Meeting	20 <sup>th</sup> June, 2019 at 03:00PM
Last Date of Online Submission of tender	5 <sup>th</sup> July, 2019 upto 03:00PM
Last Date of Submission of hard copy of EMD	5 <sup>th</sup> July, 2019 upto 03:00PM
Date of technical bid opening	6 <sup>th</sup> July, 2019

Tender Document may be downloaded from Download from following websites  
[www.aiimsjodhpur.ac.in](http://www.aiimsjodhpur.ac.in), <http://eprocure.gov.in.tenders.gov.in>



## All India Institute of Medical Sciences, Jodhpur

Basni Phase - II, Jodhpur - 342005, Rajasthan

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**Executive Engineer (E)**  
**AIIMS, Jodhpur**

## ALL INDIA INSTITUTE OF MEDICAL SCIENCES, JODHPUR

## NOTICE INVITING TENDER

S. No.	Particular	Remarks
01	Name of work	Comprehensive Maintenance & operation of 850 KLD MBR based S.T.P. including Effluent treatment tanks, Water softening plant, Inlet tank, pump room, outgoing tank for residential complex installed at A.I.I.M.S., Jodhpur
02	Tender No.	<b>AIIMS-JDH/EE/ELECT/2019-20/03</b>
03	Contract period	03 years
04	Total estimated cost for three years	Rs. 1,24,20,000/-
05	Earnest money deposit	Rs. 2,48,400/-
06	Tender documents	Download from following websites- <a href="http://www.aiimsjodhpur.ac.in">www.aiimsjodhpur.ac.in</a> <a href="http://eprocure.gov.in">http://eprocure.gov.in</a>
07	Pre-bid meeting	20 <sup>th</sup> June, 2019 (Thursday) at 03:00 PM at Committee room, Administrative Block, Medical College, AIIMS, Jodhpur.
08	Website for online submission	<a href="https://eprocure.gov.in/eprocure/app">https://eprocure.gov.in/eprocure/app</a> .
09	Last date, time and place of submission of EMD in original	5 <sup>th</sup> July, 2019 (Friday) upto 03:00 PM, at Engineering Wing, Medical College-II floor, AIIMS, Jodhpur
10	Date of online technical bid opening	6 <sup>th</sup> July, 2019

\* Please read carefully the notes given with the tender Notice.

**Executive Engineer (E)**  
**AIIMS, Jodhpur**

## ALL INDIA INSTITUTE OF MEDICAL SCIENCES, JODHPUR

**NOTICE INVITING TENDER**

All India Institute of Medical Sciences (AIIMS), Jodhpur, Rajasthan, an apex healthcare institute established by an Act of Parliament of India under aegis of Ministry of Health & Family Welfare, Government of India, invites Online bids in two bid system for tenders of Comprehensive Maintenance & operation of

1. 850 KLD MBR based S.T.P. including
2. Effluent treatment tanks,
3. Water softening plant,
4. Inlet tank, pump room, outgoing tank for residential complex installed at A.I.I.M.S., Jodhpur.

**Instructions for the Bidder/ The service provider/ Bidders:-**

1. Bids shall be submitted online only at CPPP website:  
<https://eprocure.gov.in/eprocure/app>.
2. The complete bidding process is online. Bidders should be possession of valid digital Signature Certificate (DSC) of class II or III for online submission of bids. Prior to bidding DSC need to be registered on the website mentioned above. For any assistance for e-bidding process, if required, bidder may contact to the helpdesk at 0291-2740741.
3. Bidder/service provider are advised to follow the instructions provided in the ‘Instructions to the service providers/Bidders for the e-submission of the bids online through the Central Public Procurement Portal for e-Procurement at <https://eprocure.gov.in/eprocure/app>’.
4. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.
5. **Criteria of eligibility:** Bidder who fulfill following requirement shall be eligible to apply. Joint ventures are not accepted:  
*Note: Completion certificate to be attached.*  
**“Similar works mean Comprehensive Maintenance & Operation of MBR / MBBR / SBR / SAFF based Sewerage Treatment Plant of atleast 425kLD capacity.”**
  - a. Three similar completed works each of value not less than 40% or Two similar completed works each of value not less than 60% or One similar completed work of value not less than 80% of the estimated cost put to the tender
  - b. Satisfactory job completion certificate that should have been signed by Executive Engineer or of similar rank or above; certifying the detailed scope of work handled to include electrical installations, programmable logic control panels, pumping station, digester, Chlorination and having maintained an on-site pollution testing laboratory. The bidder must have completed atleast three similar works in last seven years ending 31.03.2019 with Government / Semi-government / Reputed company (As per Annexure-III)
  - c. Bidder should have annual turnover of 100% of the tender value for the last 3 years.
  - d. Bank solvency of Rs. 50lakh or equal to tender value, whichever is less.
6. **EMD Payment:**  
The bidder shall be required to submit the Earnest Money Deposit (EMD) for an amount of **Rs. 2,48,400/- (Rupees Two Lac Forty Eight Thousand Four Hundred only)** (as per annexure-V) by way of demand drafts or Bank Guarantee only. The demand drafts or Bank Guarantee shall be drawn in favour of “All India Institute of Medical Sciences, Jodhpur”. The EMD of the successful bidder shall be returned after the successful submission of Bank Guarantee/ Security Deposit and for unsuccessful bidder(s) it would be returned after award of the contract. The demand drafts or Bank Guarantee for EMD must deliver to AIIMS, Jodhpur on or before last date/time of Bid Submission.

- a) Bidder shall not be permitted to withdraw his offer or modify the terms and conditions thereof. In case the Bidder fail to observe and comply with stipulation made herein or backs out after quoting the rates, the aforesaid amount of earnest money will be forfeited.
- b) The Firm who are registered with Micro Small Medium Enterprises (MSME) / National Small Industries Corporation (NSIC) / OR Small Scale Industries (SSI) are exempted to submit the EMD (Copy of registration must be provide along with technical bid).
- c) The EMD, in case of unsuccessful Bidders shall be retained by AIIMS, Jodhpur till the finalization of the tender. No interest will be payable by AIIMS, Jodhpur on the EMD.

The Hard Copy of earnest money deposit etc. must be delivered to the AIIMS, Jodhpur on or before last date & time of Bid Submission as mentioned above (submitted only in Dispatch/Received section). The bid without EMD will be summarily rejected

### **Submission of Tender:**

The tender shall be submitted online in two part, viz., technical bid and financial bid. All the pages of bid being submitted must be signed and sequentially numbered by the bidder irrespective of nature of content of the documents before uploading.

- ✓ **The offers submitted by Telegram/Fax/email shall not be considered. No correspondence will be entertained in this matter.**

### **I. Technical Bid**

The following documents are to be furnished by the bidder along with **Technical Bid** as per the tender document:

- Duly filled format of Technical Bid as per Annexure – I.
- Copy of constitution or legal status of the bidder manufacturer / Sole proprietorship / firm / agency etc.
- The technical bid should be accompanied by demand draft **Rs. 2,48,400/- (Rupees Two Lac Forty Eight Thousand Four Hundred only)** (Refundable) against EMD. The Demand Draft of EMD should be prepare separately and drawn in favour of **All India Institute of Medical Sciences, Jodhpur**.
- Copy of Income Tax Return Acknowledgement for last Three years (submit Form 26/26A).
- Copy of PAN Card Registration.
- Copy of GST registration certificate.
- Certificate as per Annexure-I, II, III & IV.
- All other document mentioned in tender document.

### **II. Financial Bid**

Price bid Form [As per Annexure-VIII duly filled and signed] - Price must be quoted as per format specified; failing which tender shall be summarily rejected.

**Executive Engineer (E)**  
**AIIMS, Jodhpur**

**ALL INDIA INSTITUTE OF MEDICAL SCIENCES, JODHPUR****TENDER NOTICE NO: AIIMS-JDH/EE/ELECT/2019-20/03**

Item Rate Bid for works:

**Tender for Comprehensive Maintenance & operation of 850 KLD MBR based S.T.P. including Effluent treatment tanks, Water softening plant, Inlet tank, pump room, outgoing tank for residential complex installed at A.I.I.M.S., Jodhpur.****T E N D E R**

I/We have read and examined the Notice Inviting Tender, General Conditions of Contract, Special Conditions of Contract, Scope of Work, Annexure-I to III,

We agree to keep the tender open for from the due date of its opening of technical bid and not to make any modification in its terms and conditions.

A sum of **Rs. 2,48,400/- (Rupees Two Lakh Forty Eight Thousand Four Hundred Only)** is hereby forwarded in **Demand Draft** of a scheduled bank/**Bank Guarantee** issued by a scheduled bank as earnest money. A copy of earnest money in receipt Demand Draft of a scheduled bank/Bank Guarantee issued by a scheduled bank is scanned and uploaded (strike out as the case may be). If I/We, fail to furnish the prescribed performance guarantee within prescribed period, I/We agree that the said Director, AIIMS, Jodhpur or his successors, in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I/We fail to commence work as specified, I/ We agree that Director, AIIMS, Jodhpur or the successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said performance guarantee absolutely. The said Performance Guarantee shall be a guarantee to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in all the conditions of the tender form. Further, I/We agree that in case of forfeiture of Earnest Money or Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work. I/We undertake and confirm that eligible similar work(s) has/have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/ We shall be debarred for tendering in **AIIMS, Jodhpur** in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee. I/We hereby declare that I/We shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information/derived therefrom to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Dated .....

Witness:

Signature of Contractor:

Postal Address:

Address:

Occupation:

## General Conditions of Contract

1. **"Pre –Bid Meeting"** with the intending bidders shall be held on 20<sup>th</sup> June, 2019, at 03:00 PM at Committee room, Administration Block, Medical College, AIIMS, Jodhpur. All the prospective bidders are requested to send/submit their comments/ representations on or before pre-bid meeting.
2. **Rate:** Rates to be quoted as per Financial Bid (Annexure-VIII) considering costs of all required works, minimum wages for labour and all there benefits and deductions.
3. **Validity:** The quoted rates and EMD must be valid for a period for **180 days** from the date of closing of the tender. The overall offer for the assignment and bidder(s) quoted price shall remain unchanged during the period of validity. If the bidder quoted the validity shorter than the required period, the same will be treated as unresponsive and it may be rejected. In case the tenderer withdraws, modifies or change his offer during the validity period, bid is liable to be rejected and the earnest money deposit shall be forfeited without assigning any reason thereof. The bidder should also be ready to extend the validity, if required, without changing any terms, conditions etc. of their original tender. In case the last date of sale / of receipt of tender / of opening the tender is declared as Holidays, the respective dates shall be treated as postponed to the next working day accordingly.
4. **Technical Evaluation:**
  - a) Detailed technical evaluation shall be carried out by Institute pursuant to conditions in the tender document to determine the substantial responsiveness of each tender. For this clause, the substantially responsive bid is one that conforms to all the eligibility and terms and condition of the tender without any deviation.
  - b) The Institute's determination of bid's responsiveness is to be based on the contents of the bid itself without recourse to extrinsic evidence. The Institute shall evaluate the technical bids also to determine whether they are complete, whether required sureties have been furnished, whether the documents have been properly signed and whether the bids are in order. The Director, AIIMS, Jodhpur shall have right to accept or reject any or all tenders without assigning any reasons thereof.
5. **Financial Evaluation:**
  - a. The financial bid shall be opened of only those bidders who have been found to be technically eligible. The financial bids shall be opened in presence of representatives of technically eligible bidders, who may like to be present. The institute shall inform the date, place and time for opening of financial bid.
  - b. Arithmetical errors shall be rectified on the following basis. If there is a discrepancy between the unit price and total price that is, the unit price shall prevail and the total price shall be corrected by the Institute. If there is a discrepancy between words and figures, the lesser amount shall be considered as valid. If the Supplier does not accept the correction of the errors, his bid shall be rejected.
  - c. After due evaluation of the bid(s) AIIMS, Jodhpur will award the contract to the lowest evaluated responsive tenderer. Conditional bid will be treated as unresponsive and will be rejected.
6. Right to issue and to accept or reject any or all tenders without assigning any reason thereof is reserved by the Competent Authority.
7. **Award of Contract:** The Institute shall consider placement of orders for jobs on those bidders whose offers have been found technical and financially acceptable. The Institute reserves the right to counter offer price(s) against price(s) quoted by any bidder.
8. **Signing of Contract:** The successful bidder shall be required to execute the Contract Agreement accepting all terms and conditions stipulated herein on a non-judicial stamp paper of Rs. 500/- (Rs. Five Hundred only) within fifteen days of the issue of the Letter of notification of award along with performance security. In the event of failure on the part of the successful bidder to sign the Contract within the period stipulated above, the EMD shall be forfeited and the acceptance of BID shall be considered as cancelled.

**9. Performance bank guarantee:**

- a. As a contract security for faithful performance of the contract in accordance with all the terms and conditions specified in the tender the obligations under warranty period, the successful tenderer / contractor shall furnish a Performance bank guarantee @ 5% of order value in the form of Fixed Deposit Receipt or Bank Guarantee (as per Annexure-VI) from any Nationalized Bank duly pledged in the name of the "All India Institute of Medical Sciences, Jodhpur" after receipt of supply order.
- b. Security Deposit @5% will be deducted from the consecutive running bills of the Contractor.
- c. AIIMS-Jodhpur shall have the right to encash the PBG / SD in full or part for non-compliance of any or all the terms and conditions of the tender / contract and to recover any Liquid Damages and penalties under the contract as well as against defects in the any of the warranty obligations as enumerated in the tender / contract.
- d. In case of part encashment, the validity of the PBG shall have to be kept valid for the remaining period as per contract, for the balance amount or for a period as required by AIIMS-Jodhpur.
- e. **Refund of PG-** The proportionate (1/3<sup>rd</sup>) BG shall be released on completion of every successful O&M year. The validity of the PBG shall have to be kept valid for the remaining period as per contract, for the balance amount or for a period as required by AIIMS-Jodhpur.
- f. **Refund of SD-** Release of Security Deposit of the work shall not be refunded till the contractor produces a clearance deposit after labour certificate from the Labour Officer. As soon as the work is virtually complete the contractor shall apply for the clearance certificate to the Labour Officer under intimation to the Engineer-in-Charge. The Engineer-in-Charge, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the contractor in respect of the work. If no complaint is pending, on record till after 3 months after completion of the work and/or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Security Deposit will be released if otherwise due.

**7. Authority of person signing document:** A person signing the tender form or any documents forming part of the contract on behalf of another shall be deemed to warranty, that he has authority to bind such other and if, on enquiry, it appears that the person so, signing had no authority to do so, the Director, AIIMS, Jodhpur may without prejudice to other Civil and criminal remedies cancel contract and held the signatory liable for all cost and damages.

**8. Right of acceptance:** The Director, AIIMS, Jodhpur reserve the right to accepting the whole or any part or portion of the bid; and the bidder shall provide the same at the rates quoted. The Director, AIIMS, Jodhpur reserve the right to reject any or all tenders /quotations or all offers received in response to the tender or cancel or withdraw the tender notice without assigning any reason thereof and also does not bind itself to accept the lowest quotation or any tender and no claim in this regard shall be entertained

**9. Inspection:**

- (a) AIIMS, Jodhpur shall have the right to inspect and/or to test the goods to confirm their conformity to the NIT Specifications at no extra cost to the Purchaser.
- (b) AIIMS, Jodhpur right to inspect, test and, where necessary, reject the Goods after the goods arrival at the final destination shall in no way be limited or waived by reason of the Goods having previously been inspected, tested and passed by AIIMS, Jodhpur prior to the goods shipment.
- (c) The Director, AIIMS, Jodhpur shall be the final authority to reject full or any part of the supply which is not confirming to the specification and other terms and conditions.

**10.** Information and instruction for Service provider for tendering forming part of NIT and to be posted on website.

**11.** Right to issue and to accept or reject any or all tenders without assigning any reason thereof is reserved by the Competent Authority.

**12.** Rate should be quoted in Indian Rupees (INR) on DOOR Basis Delivery at AIIMS, Jodhpur inclusive



of all charges. Where there is a difference between the rates in figures and words, lower of the two rates shall be taken as valid and correct rate. The service provider shall take into account all the costs involved in compliance of all the special conditions and as stated above while quoting his rates in his tender for this work.

- 13. Subletting of Work:** The firm shall not assign or sublet the work/job or any part of it to any other person/party or will first obtain permission in writing from the Competent Authority of AIIMS, Jodhpur, which will be at liberty to refuse if thinks fit. The tender is not transferable. Only one tender shall be submitted by one bidder.
- 14. Breach of Terms and Conditions:** In case of breach of any terms and conditions as mentioned in tender, the Competent Authority, will have the right to reject the bid at any stage without assigning any reason thereof and nothing will be payable by AIIMS, Jodhpur in that event the EMD shall also stands forfeited.
- 15. Insolvency etc.:** In the event of the firm being adjudged insolvent or having a receiver appointed for it by a court or any other order under the Insolvency Act made against them or in the case of a company the passing any resolution or making of any order for winding up, whether voluntary or otherwise, or in the event of the firm failing to comply with any of the conditions herein specified AIIMS, Jodhpur shall have the power to terminate the contract without any prior notice.
- 16.** The taxes or any other charge if payable extra should be clearly mentioned otherwise no extra charge will be paid.
- 17.** The items will have to be supplied at Institute site. No transportation/ cartage charges will be provided for the same.
- 18.** Signed & stamped compliance sheet of the technical specification of the goods with technical printed literature must be enclosed with technical bid.
- 19.** Bidder shall submit a copy of the tender document and corrigendum/addendum thereto, if any, with each page of this document should be signed and stamped to confirm the acceptance of the entire terms & conditions as mentioned in the tender documents.
- 20.** After the evaluation of the bid(s) AIIMS, Jodhpur will award the contract to the lowest evaluated responsive bidder on composite basis. Conditional bid will be treated as unresponsive and will be rejected
- 21. Applicable Law:**
  - The contract shall be governed by laws and procedures established by Govt. of India, within the framework of applicable legislation and enactment made from time to time concerning such commercial dealings/ processing.
  - The contractor shall follow all the government labour laws, minimum wages, labour safety, labour insurance etc. A
  - Any disputes are subject to exclusive jurisdiction of competent court and forum in Jodhpur, Rajasthan, India only.
  - The Arbitration shall be held in accordance with the provision of the Arbitration and conciliations Act, 1996 and the venue of arbitration shall be at Jodhpur. The decision of the Arbitrator shall be final and binding on both the parties.
  - Force Majeure: Any delay due to Force Majeure will not be attributable to the service provider.

22. **Guarantee / Warrantee Period:** Service provider must provide one (01) year comprehensive on-site warranty for all the items replaced during the course of agreement and same will be started from the date of the satisfactory installation of item against any defect, workmanship and poor quality. The replaced component/s will be handed over to AIIMS, -Jodhpur
23. Bidder shall submit delivery challan (TAX invoice) for the material to be supplied along with lot number mentioned on it.
24. Conditional tenders are liable to be summarily rejected.
25. The rates shall be quoted only in the schedule of quantities attached with the tender and nowhere else i.e. letter heads etc.
26. The contractor is specifically required to quote only one rate against each item. The rate Quoted for any item of material shall conform to the prescribed specifications.
27. The quantities are approximate and are liable to change up to any extent on either side. The Engineer-in-Charge reserves right to order deviation from the quantities mentioned in the tender. The contractor shall supply the additional quantity on the rates quoted in the tender documents irrespective of deviation limit mentioned elsewhere in the agreement. The contractor shall have no claim to any payment or compensation whatsoever on account of any profit or advantage which he might have derive from the execution of supply in full as mentioned in tender but which did not derive any consequence of the full supply of material mentioned in tender not having been ordered.
28. Before acceptance of tender the tenderer shall arrange the samples of material for which he has tendered and get the same approved from the Engineer-in-Charge who will be the final authority in the respect.
29. Any information / document required for verification shall be provided by the bidder.

**Executive Engineer (E)**  
**AIIMS, Jodhpur**

**SPECIAL CONDITIONS OF CONTRACT**

1. For all items of Civil, Electrical, Plumbing etc.; CPWD / IS specifications with correction slips up to the date of receipt of tender shall be followed. For the items which are not covered under CPWD / IS specifications; the special conditions / B.I.S. specifications shall apply. In this regard the decision of Engineer-in-charge shall be final.
2. Wherever any reference is made of any Indian Standard, it shall be taken as reference to the latest edition with all amendments / revision issued thereto up to the date of receipt of tenders.
3. Other agencies working at site will also simultaneously execute the work entrusted to them and the contractor shall offer necessary co-operation wherever required to other agencies.
4. On account of security consideration, there could be some restrictions on the working hours, movement of vehicles for transportation of materials. The contractor shall be bound to follow all such restrictions and adjust the program for execution accordingly, for which nothing extra shall be paid.
5. The work shall be carried out in a manner complying in all respects with the requirements of relevant bye laws of the local bodies, labour laws, minimum wages act, workmen compensation act and other statutory laws enacted by Central Govt. as well as State Govt.
6. All malba/rubbish/silt/waste, garbage etc. generated due to any operation whatsoever shall be disposed-off on daily basis.
7. No residential accommodation shall be provided to any of the staff engaged by the contractor. The contractor shall not be allowed to erect any temporary set up for staff in the campus.
8. No claims of the labours shall be entertained by the Department including that of providing employment, regularization of services etc.
9. The contractor shall depute required staff having requisite experience. The contractor shall furnish an undertaking about the staff deputed once at site of work that he will not replace them before the period of two year or date of completion whichever is earlier without the consent of Engineer-in-charge. On Sundays all staff shall be present at plant. However, in case of emergency, all the staff shall have to be present even on odd-hours/holidays/Sundays as and when required by the site staff. For any staff on leave substitute staff shall be provided by the contractor without any extra cost.
10. Log book, Attendance Register and other records will have to be produced either daily according to the requirement or when asked to do so by the Engineer-in-charge or his authorized representative.
11. When a register gets completed, it will be handed over to the concerned J.E. / A.E. It will not be returned to the contractor and the same will remain the property of the department.
12. All required register will be issued by Engineer-in-charge duly marked in chronological order but the contractor will have to arrange all such registers/stationery etc. Nothing extra shall be paid on this account.
13. The contractor will have to arrange all the required furniture etc. at his own cost pertaining to his job and he will take all these things back only after the expiry of the agreement for which nothing extra shall be paid.
- 14. The personnel and laborers engaged by the contractor under this contract shall wear neat and clean uniforms as approved by the Engineer-in-charge along with name badges. An identity card duly countersigned by Engineer-in-charge or his representative shall be issued to each personnel**

**by the contractor to have proper identifications. The character and antecedents of the staff employed by the contractor shall be got verified from the police by the contractor.**

15. The contractor shall have registration with Employee's Provident Fund commissioner and Employee's state Insurance Corporation for safe guarding interest of his workmen. He shall obtain all other necessary approvals from statutory bodies as per law in vogue.
16. All T&P, Scaffoldings, Instruments/Meters for Maintenance, Consumable and Contingent Articles required for execution of the work shall be arranged by the etc. along with all the consumable accessories in sufficient number as required.
17. Staff employed by the contractor should be well behaved, Polite & courteous. Any complaint against staff on behavior should be taken very seriously and such staff should be removed by the contractor immediately from the site and replacement shall be provided immediately.
18. For the Purpose of categorization of staff as skilled, semi-skilled and unskilled, the Beldars shall be taken as unskilled, the Wireman / Lift operator shall be taken as semi-skilled and the Mason/Plumber/ Welder/ Electrician and carpenter shall be taken as skilled.  
**The recruitment of all contractor's staff and increased or reduction of staff should be as per actual necessity at site with the prior approval of Engineer – In – Charge only.**
19. The contractor shall make all safety arrangement required for the labour engaged by him at his own cost. All consequences due to negligence or due to lapse of security/safety or otherwise shall remain with the contractor. The department shall not be responsible for any mishap, injury, accident or death of the contractor's staff. No claim in this regard shall be entertained / accepted by the department.
20. Contractor shall be fully responsible for any damages caused to govt. property or allottee's property by his or his labour in carrying out the work and shall be rectified by the contractor at his own cost.
21. GST as applicable shall be paid to the contractor on production of challans on actual basis along with an undertaking also to be provided.
22. Required Space will be handed over to the contractor free of cost by the department.
23. The agency shall restore back the premises and other articles provided by the department to the department at the time of closure of the contract.
24. Any reference made to any Indian standards specifications in these documents, shall imply to the latest version of that standard, including such revisions/amendments as issued by the Bureau of Indian Standards up to last date of receipt of tenders. The contractor shall keep at his own cost all such publications of relevant Indian Standards applicable to the work at site.
25. The contractor will maintain attendance records of the staff, which will be checked by the Junior Engineer/Assistant Engineer/Executive Engineer-in-charge of the work. In case of absence of any staff, recovery shall made at the following rates:
  - i. Skilled labour @ Rs. 1,000/- per day per person.
  - ii. Unskilled labour @ Rs. 700/- day per person.
  - iii. Transportation vehicle @ 8000/- per day.**The monthly running bills of contractor will proceed after submission of monthly ESI& PF Challans and GST invoice.**
26. Contractor has to provide drinking water facility by providing necessary filter (R.O.) with water cooler for AIIMS, Jodhpur staff and his staff. Watch and ward of enquiry office shall be the responsibility of the agency.

27. The contractor will not pitch up tents for laborers, materials and his stores etc.,
28. No permanently / temporary huts / structures shall be constructed by the contractor at the site of work or at any government land / premises. Such structures, if any, found at the site or at AIIMS, Jodhpur land shall be demolished and removed at the cost of the agency without any notice.
29. Any damage to the building structure, fittings or any other articles etc. done by the contractor or his workman during the execution of the work shall be made good by the contractor at his own cost.
30. The contractor shall clear the site properly after the completion of the work.
31. The Agency shall be solely responsible for compliance to the provisions of various Labour and industrial laws, such as, wages, allowances, compensations, EPF, Bonus, Gratuity, ESI etc. relating to personnel deployed by it at AIIMS, Jodhpur site or for any accident caused to them and the institute shall not be liable to bear any expense in this regard. **The Agency shall make payment of wages to workers engaged by it by the stipulated date (before 7<sup>th</sup> of every month) irrespective of any delay in settlement of its bill by the AIIMS, Jodhpur for whatever reason.** The Agency shall also be responsible for the insurance of its personnel. The Agency shall specifically ensure compliance of various Laws / Acts and their amendments etc., including but not limited to with the following and their re-enactments / amendments / modifications:
- The Payment of Wages Act 1936
  - The Employees Provident Fund & MP Act 1952
  - The Contract Labour (Regulation) Act, 1970
  - The Payment of Bonus Act, 1965
  - The Payment of Gratuity Act, 1972
  - The Employees State Insurance Act, 1948
  - The Employment of Children Act, 1938
  - The Motor Vehicle Act, 1988
  - Minimum Wages Act, 1948
32. **Breach of Terms and Conditions:** Noncompliance of any terms and conditions enumerated in the contract shall be treated as breach of contract. Or In Case of breach of any terms and conditions as mentioned above, the Competent Authority, will have the right to reject the bid at any stage without assigning any reason thereof and nothing will be payable by AIIMS, Jodhpur in that event the EMD shall also stands forfeited.
33. **Termination of Contract:** AIIMS, Jodhpur would have the right to terminate the contract by giving one month's notice before the expiry of the term, in case the work performance is not up to the standard, or in case there is any violation of AIIMS, Jodhpur rules & regulations, or if there is any lapse in compliance of any labour legislation, or if there is any incident of indiscipline on the part of the Tenderer or his staff and the agreement may be terminated by either party by giving one month's notice to the institution. The decision of AIIMS, Jodhpur's management in this regard would be final and binding on the Tenderer. In such an event, AIIMS, Jodhpur shall have the right to engage any other tenderer to carry out the task.
34. **Arbitration:** The Arbitration shall be held in accordance with the provision of the Arbitration and conciliations Act, 1996 and the venue of arbitration shall be at Jodhpur. The decision of the Arbitrator shall be final and binding on the both parties.
35. **Dispute Settlement:** It is mutually agreed that all differences and disputes arising out of or in connection with this agreements shall be settled by mutual discussions and negotiations if such disputes and differences cannot be settled and resolved by discussions and negotiations then the same shall be referred to the sole Arbitrator appointed by the Director, AIIMS, JODHPUR whose decision shall be final and binding on both the parties. The contract shall be governed by laws and procedures

established by Govt. of India, within the framework of applicable legislation and enactment made from time to time concerning such commercial dealings/ processing.

36. **Guidelines issued by Hon'ble National Green Tribunal** in O.A. No. 21 of 2015 and O.A. No.95 of 2014 in the matter of Vardhaman Kaushik Vs. Union of India & other and Sanjay Kulshreshtha V/s Union of India & ORS : Air Pollution of Dust from Construction and Demolition activity reg. issued vide letter No. DPCC/EIA/Ref-001 to 172/NGT-21/2015/225-408 dt. 17/04/2015 shall be complied by the Bidders.
37. The material shall be as per CPWD / IS specifications with up to date correction slip and ISI specifications.
38. In the event of any variation between CPWD / IS specifications and that in the IS Code the former shall take precedent over the later. In the event of variation between the nomenclature of item as per schedule of quantities and specifications, the former shall prevail.
39. The sample of all the items shall have to be got approved by the Contractor from the Engineer-in-Charge before the supply commences, the approval of sample shall be only in respect of workmanship and finish, and shall be without prejudice to the right of Engineer-in- Charge to get random samples tested out of the actual lot received as per additional conditions.
40. The Engineer-in-Charge shall be at liberty to test respective sample (s) of each item (to be replaced) in any approved laboratory as decided by him. The sample for testing shall be provided by the contractor. If the test proves satisfactory and the material is accepted, the testing charge in respect of satisfactory test shall be borne by the department. All other expenditure required to be incurred for making available the sample, conveyance and packing etc, shall be borne by the contractor himself. In case any sample of particular lot fails in testing the contractor shall be bound to replace the entire lot with fresh material of prescribed specifications and the rejected lot shall only be returned to the contractor after fresh lot is supplied. Testing charges in respect of failed sample will be borne by the contractor himself.
41. Rejected materials shall have to be removed by the contractor at his own cost within a week of the instructions of doing so. Also go down rent as decided by Engineer-in-Charge shall be charged by the department.

**Executive Engineer (E)**  
**AIIMS, Jodhpur**

**SCOPE OF WORK**

Sr. No.	Description	Scope of Work	Remarks
<b>A. Operational services</b>			
A01	Day to day operation 24x7 for 365 days & routine maintenance and to follow daily /Weekly / fortnightly / annual checks.	Service Provider	
A02	Provide professional, skilled & semi- skilled manpower for all the installed equipments operation.	Service Provider	Trained manpower shall Only be deputed at the site.
A03	Providing, Preparing & Dosing Chemical Solutions of required concentration and quantity.	Service Provider	
A04	Collection, removal and disposal of sludge. Maintain the MLSS level in Bio reactor.	Service Provider	
A05	Sampling- Collecting water / effluent Sample on day-to-day basis.	Service Provider	
A06	Submission of operation data as per Clients requirement.	Service Provider	
A07	Procurement, handling and unloading of chemicals.	Service Provider	
A08	Operations of air blowers, pumps & softening agitator tank.	Service Provider	
A09	Operation of all electrical & mechanical machinery including electrical panels	Service Provider	
A10	General cleaning and house-keeping	Service Provider	
<b>B. Maintenance services</b>			
B01	Preventive/ maintenance /repairing/ rewinding of pumps, blower, motors and other equipments.	Service Provider	Not in case if breakdown is caused due to strikes, lockouts, civil commotion, war, theft, floods, riots, explosion or act of God or cause beyond human control.
B02	Cleaning / Preventive maintenance of the air filters on Air Blowers regularly. Change the Air Filters Periodically.	Service Provider	
B03	Maintenance of civil structures, roads etc.	AIIMS, Jodhpur	
B04	Painting of equipments, pipes and buildings etc.	AIIMS, Jodhpur	
B07	Provision of heavy lifting equipments like Hydra, Crain's, Forklifts, Chain pulley block with tripod etc.	As per orders of AIIMS, Jodhpur	
B08	Provision of general Tool Kits	Service Provider	As per list given below
B09	Provision of Special Tool & Tackles	Service Provider	

B10	Overhauling & Breakdown maintenance of equipments	Service Provider	
B11	Calibration of Lab / Field equipments & instrument	Service Provider	
B12	Oil & grease chamber, all screen bars (manual & auto) and all tank cleaning	Service Provider	
B13	All type of valves (Solenoid, butterfly, gate, non-return etc.)	Service Provider	If required to be replaced then the work should be done as per orders of AIIMS, Jodhpur
B14	Preventive & breakdown maintenance of softening agitator tank & pump	Service Provider	
B15	Maintenance of air blowers, pumps & softening agitator tank.	Service Provider	
B16	Maintenance of all electrical panels & mechanical machinery including electrical panels and to follow daily / weekly/ fortnightly / monthly / annual checks.	Service Provider	
<b>C. Laboratory services</b>			
C1	Provision of well-equipped laboratory	AIIMS, Jodhpur	All required test kits & meters for on-site laboratory i.e. BOD, COD, DO, Ecoli and Turbidity will be provided by AIIMS-Jodhpur
C2	Provision of well-equipped laboratory	Service Provider	All required test kits & meters for on-site laboratory i.e. pH, TS, TDS, SS, Temperature, conductivity, chlorine demand, residual chlorine, MLSS, MLVSS, SVI etc. will be provided by the service provider.
C3	Analysis of various samples of water / waste water as applicable.	Service Provider	
C4	Testing by external agency if required.	Service Provider	
<b>D. Material supply</b>			
D1	Supply of proprietary chemicals (DWPE) for the plant for operations.	AIIMS, Jodhpur	
D3	Supply of required other commodity chemicals (Hypo, Citric acid, NaCl) for the plant operation.	AIIMS, Jodhpur	
D4	Supply of major and minor spares of the plant operation like lubricants, cotton waste, oil & grease, kerosene etc.	AIIMS, Jodhpur	
D5	Supply of maintenance consumables like rustoline, gaskets, packing, v-belts etc.	Service Provider	
D6	Supply of adequate Personal Protective Equipments	Service Provider	
D7	Any equipment replacement	As per orders	



		of AIIMS, Jodhpur	
<b>E. Statutory requirements &amp; clearness</b>			
E1	All statutory & Environmental clearances & taxes.	<b>AIIMS, Jodhpur</b>	To obtain necessary clearance from pollution control board the service provider will provide all necessary documents & will cooperate during inspection.
E2	Monthly payment of O&M Bills	<b>AIIMS, Jodhpur</b>	
E3	Ensuring availability of raw water as per design specifications, electrical power etc. required for operation of the plant.	<b>AIIMS, Jodhpur</b>	
E4	Statutory norms as per applicable labor law	<b>Service Provider</b>	
E5	Plant security round the clock	<b>AIIMS, Jodhpur</b>	
E6	Transportation within the complex.	<b>Service Provider</b>	
E7	Any medical facility on site	<b>Service Provider</b>	
F1	Maintaining Daily / Weekly / Monthly reporting and log book. All the running records of effluent quality; laboratory test, chemical consumption record etc. in standard format shall be maintained by the service provider as directed / as per updated guidelines of pollution control board.	<b>Service Provider</b>	All reports and log book will be checked by AIIMS, Jodhpur.
F2	In house technical expertise	<b>Service Provider</b>	
F3	Availability of all spares and equipments as per requirement	<b>Service Provider</b>	Tracking/monitoring stocks available and ensuring procurement on time.
<ul style="list-style-type: none"> <li>❖ The service provider will ensure that effluent from Effluent tanks shall be suitable before feeding it into STP for further treatment. The service provider will maintain all the design outlet parameters of MBR Based STP Plant as per manufacturer manual. (to be handed over during handing over of the site)</li> <li>❖ The service provider will ensure that the hardness of softening water should not exceed from 50 to 60 PPM.</li> </ul>			

1. All the details regarding equipment installed at STP, AIIMS, Jodhpur is given in Annexure-IV.
2. The equipment / plant shall be handed over by AIIMS, Jodhpur to the service provider at the start of the contract and shall be maintained in line with manufacturer maintenance manual (to be handed over during handing over of the site)
3. AIIMS, Jodhpur will provide space, power, water, Lab building, illumination, water of right quality, security of plant etc. as per service provider recommendation and requirements.
4. This contract is non-transferable and is applicable only to the units mentioned in this proposal.
5. Any instructions given in operations & maintenance manual shall be followed.
6. The Contractor's plant manager who is present at the site from 9:00 AM to 5:00 PM on all working days shall carry

mobile telephone(s) to enable the Engineer-in-charge to have easy and quick communication. Nothing extra shall be paid to the contractor on this account and his quoted rates for various items under this contract will be inclusive of this obligation.

7. Agency shall avail the facility of existing one no. telephone & one internet/broadband connection provided by the department. However the payment of bills for the same shall be borne by the agency itself.
8. All the preventive & remedial measures to mitigate occupational safety & health risks shall be provided by the service provider / bidder in STP/WTP/ETP operations. All the personnel protective equipments shall be provided by the service provider / bidder.
9. **Technical / Operational team (qualification below is minimum)**

Name of designation	Qty.	Unit	Type of labour	Qualification
Plant manager	01	Nos.	Highly Skilled	Environmental engineer / B.Sc. Chemistry with minimum 3 years working experience in relevant field.
Plant Operators	04	Nos.	Skilled	I.T.I. (in electrician / fitter trade) with minimum 2 years working experience in relevant field.
Electrical / Mechanical technicians	02	Nos.	Skilled	I.T.I. (in electrician / fitter trade) with minimum 1 year working experience in relevant field.
Laboratory analyst	01	Nos.	Skilled	Laboratory analyst is a qualified individual who has knowledge of water and waste water chemistry and is trained in preparations of laboratory chemicals, use of laboratory instruments, collection and preservation of water / waste water samples and analysis for various environmental parameters such as pH, SS, BOD, COD, TDS etc.
Helper	02	Nos.	Unskilled	N.A.
<b>Total No of</b>	<b>10</b>	Nos.		

❖ **NOTE: The number of highly skilled / skilled/ semiskilled / unskilled labour can be increased / reduced as per actual necessity of site with the approved of Engineer-in- charge without any additional charges.**

**10. Penalty for non-availability of manpower:**

The contractor will maintain attendance records of the staff, which will be checked by the Engineer-in-charge or his representative. In case of absence of any staff recovery shall make at the following rates:

- i. Highly skilled labour @ Rs. 1,000/- per day per person.
- ii. Skilled labour @ Rs. 800/- per day per person.
- iii. Semi-skilled @ Rs. 600/- per day per person.
- iv. Unskilled @ Rs. 400/- per day per person.

11. The Agency shall be solely responsible for compliance to the provisions of various Labour and industrial laws, such as, wages, allowances, compensations, EPF, Bonus. Gratuity, ESI etc. relating to personnel deployed by it at AIIMS, Jodhpur site or for any accident caused to them and the institute shall not be liable to bear any expense in this regard. The Agency shall make payment of wages to workers engaged by it by the stipulated date irrespective of any delay in settlement of its bill by the Administrative Officer, at AIIMS, Jodhpur for whatever reason. The Agency shall also be responsible for the insurance of its personnel. The Agency shall specifically ensure compliance of various Laws / Acts, including but not limited to with the following and their re-enactments / amendments / modifications: -

- (a) The Payment of Wages Act 1936
- (b) The Employees Provident Fund & MP Act, 1952
- (c) The Contract Labour (Regulation) Act, 1970
- (d) The Payment of Bonus Act, 1965
- (e) The Payment of Gratuity Act, 1972
- (f) The Employees State Insurance Act, 1948
- (g) The Employment of Children Act, 1938
- (h) The Motor Vehicle Act, 1988
- (i) Minimum Wages Act, 1948

## 12. Penalty for quality of treated water:

S. No.	Testing	Treated water characteristics	if outlet parameters exceeds >10%	if outlet parameters exceeds >20%
1.	pH	6.5 -8.5	1.5% penalty on monthly billing	2% penalty on monthly billing
2.	BOD <sub>5</sub> @ 20°C	≤ 5 mg / liter	1.5% penalty on monthly billing	2% penalty on monthly billing
3.	COD (Cr)	≤ 20- 30 mg / liter	1.5% penalty on monthly billing	2% penalty on monthly billing
4.	TSS	≤ 5 mg / liter	1.5% penalty on monthly billing	2% penalty on monthly billing
5.	Turbidity	< 2 NTU	1.5% penalty on monthly billing	2% penalty on monthly billing
6.	Oil & Grease	< 5 mg/liter	1.5% penalty on monthly billing	2% penalty on monthly billing
7.	Colour	Clear/ Unobjectionable	1.5% penalty on monthly billing	2% penalty on monthly billing
8.	Ecoli	Removal to the level of log <sup>6</sup>	1.5% penalty on monthly billing	2% penalty on monthly billing

13. It shall be responsibility of the service provider / bidder to ensure the quality of treated water / effluent to comply with local authority requirement & following characteristics whichever is stringent

S. No.	Item of analysis	Unit in mg/l or otherwise
1.	Temperature of discharge	45 °C
2.	Colour	7 lovibond / unit
3.	pH value	6.0 to 8.5
4.	B.O.D. (5day at 20°C)	5 mg
5.	C.O.D.	20-30
6.	Total Suspended Solid	5.0
7.	Total Dissolved Solid	2000.0
8.	Residual Chlorine	>1.0
9.	Sulphate (as SO <sub>4</sub> )	500.0
10.	Sulphite (as sulphure)	0.2
11.	Cyanide (CN)	0.1
12.	Detergent (linear alkylate sulfonate as methylene blue active substances)	15.0

13	Grease & oil	5 mg / liter
14	Arsenic	1.0
15	Barium	5.0
16	Tin	10.0
17	Iron (Fe)	20
18	Beryllium	0.5
19	Boron	5.0
20	Manganese	5.0
21	Phenolic compound	0.2
22	Cadmium	0.1
23	Cromium (trivalent & hexavalent)	1.0
24	Copper	0.1
25	Lead	0.1
26	Mercury	0.05
27	Nickel	1.0
28	Selenium	0.5
29	Silver	0.1
30	Zinc	1.0
31	Metals in total	1.0
32	Chlorine (free)	1.0
33	Phosphate	5.0
34	Calcium	200.0
35	Magnesium	200.0
36	E-coli	Nil
37	Hardness Inlet (For water softening plant)	400 mg/l
38	Hardness Outlet (For water softening plant)	Commercial zero
39	Regeneration period (For water softening plant)	12 hours
40	Quantity of soft water between two regenerations (For water softening plant)	850,000 liters
41	Operation pressure (For water softening plant)	3 kg/cm <sup>2</sup>
42	Test pressure (For water softening plant)	4.5 kg/cm <sup>2</sup>

**Executive Engineer (E)**  
**AIIMS, Jodhpur**

**Annexure - I****Technical Bid**

<b>S. No.</b>	<b>Details of the Bidder / Bidder</b>	
1.	Name of Firm /Service provider / service provider	
2.	Complete Address:	
3.	Name of Proprietor/ Partner/ Managing Director / Director.	
4.	State clearly whether it is sole proprietor or partnership firm or a company or a Government Department or a Public Sector Organization	
5.	Details of Earnest Money Deposit (EMD) (Yes / No) DD No.: Dated: Drawn on Bank: Amount: (Rupees.....)	
6.	Whether each page of NIT and its annexure have been signed and stamped	
7.	Whether the firm is a registered firm Yes/No (attached copy of certificate).	
8.	Copy of GST Registration	
9.	Permanent Account No. (Copy must be provided)	
10.	Copy of Income Tax Return Acknowledgement for last Three years	
11.	Any other information, if necessary	
12.	Name and address of service centre at/ nearby Jodhpur	
13.	Official Email ID	
14.	Contact No.	

❖ **Note: All pages should be numbered & indexed.**

Date:  
Place:

Name :  
Business Address:  
Signature of Bidder: Seal of  
the Bidder:

**Annexure-II**  
**UNDERTAKING**  
**(To be submitted on letter head of the company / firm)**

I hereby certify that the above firm has not been ever blacklisted by any Central / State Government / Public Undertaking / Institute on any account.

I also certify that firm will supply the item as per the specification given by Institute and also abide all the terms and conditions stipulated in tender.

I also certify that the information given in the bid is true and correct in all aspects and if in any case at a later date it is found that any detail/s provided are false and incorrect, any contract given to the concern firm or participation may be summarily terminated at any stage, the firm will be blacklisted and Institute may imposed any action as per NIT rules.

Date:

Place:

Name :

Business Address :

Signature of Bidder :

Seal of the Bidder :

**Annexure-III**

**Details of all works of similar class completed during the last seven years ending last day of the month ending March, 2019.**

**Attached certified copies of experiences (Can use extra sheet if necessary)**

<b>S. No .</b>	<b>Name of Work / Project</b>	<b>Owner or Sponsoring Organization</b>	<b>Cost of work (in lac)</b>	<b>Date of Commencement as per contract</b>	<b>Stipulated date of completion</b>	<b>Actual date of completion</b>	<b>Litigation/ arbitration pending / in progress with details</b>	<b>Name and address/ telephone number of officer to whom reference may be made</b>	<b>Remarks</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>

**\* Indicate gross amount claimed and amount awarded by the Arbitrator.**

**\* Please attach completion & performance certificates from authorized person.**

Date:

Name :

Place:

Business Address :

Signature of Bidder :

Seal of the Bidder :

**Annexure-IV****FORM No. 26A**

[See rule 31ACB]

**Form for furnishing accountant certificate under the first proviso to sub-section (1) of section 201 of the Income-tax Act, 1961**

I (name) \_\_\_\_\_ am the person responsible for paying (within the meaning of section 204) in the case of (name of the payer) \_\_\_\_\_ with PAN # (PAN of the payer) \_\_\_\_\_ and TAN (TAN of the payer) \_\_\_\_\_ located at (address of the payer)

I do hereby state that I, being the person responsible for paying had paid to/credited to the account of (name of the payee) \_\_\_\_\_ a sum of \_\_\_\_\_ rupees without deduction of whole or any part of the tax

A certificate from an accountant certifying that the payee has fulfilled all the conditions mentioned in the first proviso to sub-section (1) of section 201 of the Income-tax Act, 1961 is enclosed as Annex 'A' to this Form

I further state that the interest under sub-section (1A) of section 201 amounting to \_\_\_\_\_ rupees for non-deduction/short deduction of tax \* has been paid by me the details of which are as under -

<i>BSR Code/**24G Receipt Number (first seven digits of BIN)</i>	<i>Challan Serial Number/**DDO Serial Number (last five digits of BIN)</i>	<i>Date of deposit through challan/**date of transfer voucher</i>

or

\*has not yet been paid by me.

Place

Signature

Date

Designation

# In case of Government deductors "PAN NOT REQD" should be mentioned

\* Delete whichever is not applicable

\*\* For payment made without the production of challan

**ANNEXURE A****Certificate of accountant under first proviso to sub-section (1) of section 201 of the Income-tax Act, 1961 for certifying the furnishing of return of income, payment of tax etc. by the payee**

I/We \*hereby confirm that I/we\* have examined the relevant accounts, documents and records of (name and address of the payee with PAN) \_\_\_\_\_ for the period \_\_\_\_\_ and hereby certify the following:

(i) \_\_\_\_\_ (payer) has paid to or credited following sum to the account of \_\_\_\_\_ (payee) without deduction of whole or any part of the tax in accordance with the provisions of Chapter-XVII-B

<i>Nature of</i>	<i>Date of</i>	<i>Section under</i>	<i>Amount</i>	<i>Amount of</i>	<i>Details of amount</i>



<i>payment</i>	<i>payment or credit</i>	<i>which tax was deductible</i>	<i>paid or credited</i>	<i>tax deductible</i>	<i>deducted, if any</i>	
					<i>Amount deducted</i>	<i>Date of deduction</i>

(ii) The payee, who is a resident, has furnished his return of income for the assessment year \_\_\_\_\_ relevant to the payment referred to in (i) above. The details of return of income filed by the payee are as under -

<i>Date of filing return</i>	<i>Mode of filing i.e. whether e-filed or paper return</i>	<i>Acknowledgement number of return filed</i>	<i>If paper return designation and address of the Assessing Officer</i>	<i>Amount of total taxable income as per return filed</i>	<i>Tax due on the income declared in the return</i>	<i>Details of tax paid</i>

(iii) The payee has taken into account the sum referred to in (i) for computing his taxable income in return of income filed by him the details of which are as under -

<i>Receipt on which Tax has not been deducted</i>	<i>Head of Income under which the receipt is accounted for</i>	<i>Gross receipt under the head of income under which the receipt is accounted for</i>	<i>Amount of taxable income under the head of income under which the receipt is accounted for</i>

(iv) It has been ensured that the information furnished is true and correct in all respects and no relevant information has been concealed or withheld

(v) Neither I, nor any of my partners, is a director, partner or an employee of the above mentioned entities or its associated concerns

I/we\* fully understand that any statement made in this certificate, if proved incorrect or false, will render me/us\* liable for any penal or other consequences as may be prescribed in law or is otherwise warranted

(Signature and Stamp/Seal of the Signatory)

†Accountant

Place

Name of the Signatory

Date

Full Address

Membership No.

Notes:

- \*Delete whichever is not applicable
- †This certificate is to be given by -

- (i) a chartered accountant within the meaning of the Chartered Accountants Act, 1949 (38 of 1949); or
- (ii) any person, who in relation to any State, is, by virtue of the provisions in sub-section (2) of section 226 of the Companies Act, 1956 (1 of 1956), entitled to be appointed to act as an auditor of companies registered in that State.

**Annexure-V**  
**FORM OF PERFORMANCE SECURITY (GUARANTEE)**

1. In consideration of the Director, AIIMS, Jodhpur (hereinafter called "The Government") having offered to accept the terms and conditions of the proposed agreement between \_\_\_\_\_ and \_\_\_\_\_ (hereinafter called "the said Agreement") having agreed to production of a irrevocable Bank Guarantee for Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) as a Security/Guarantee from the contractor(s) for compliance of his obligation in accordance with the terms and conditions in the said agreement.  
 We \_\_\_\_\_ (hereinafter referred to as Bank) hereby (Indicate the name of the Bank) undertake to pay to the Government an amount not exceeding Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) on demand by Government .
2. We \_\_\_\_\_ do hereby undertake to pay the (Indicate the name of the Bank) amount due and payable under this Guarantee without any demur, merely on a demand from the Government stating that the amount claimed is required to meet the recoveries due or likely to be due from the said contractor (s). Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs . \_\_\_\_\_ (Rupees \_\_\_\_\_ only)
3. We the said bank undertake to pay to the Government any money so demanded notwithstanding any dispute or disputes raised by the contractor (s) in any suit or proceeding pending before any court or Tribunal relating thereto, our liability under this present being absolute and unequivocal.
4. The payment so made by us under this bond shall be valid discharge of our liability for payment thereunder and the contractor (s) shall have no claim against us for making such payment.
5. We \_\_\_\_\_ further agree that the guarantee herein contained (Indicate the name of Bank) shall remain in full force and effect during the period that would be taken for the performance of the said agreement and it shall continue to be enforceable till all the dues of the Government under or by virtue of the said agreement have been fully paid, and its claims satisfied or discharged, or till Engineer-in- charge on behalf of the Government, certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said contractor (s) accordingly discharges this guarantee.
6. We \_\_\_\_\_ further agree with the Government that the (Indicate the name of Bank) Government shall have the fullest liberty without our consent, and without affecting in any manner our obligations hereunder, to vary any of the terms and conditions of the said agreement or to extend time of performance by the said contractor (s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Government against the said contractor (s) and to forebear or enforce any of the terms and conditions relating to the said agreement & we shall not be relieved from our liability by reasons of any such variation or extension being granted to the said contractor (s) or for any forbearance, act of omission on that part of the Government or any indulgence by the Government to the said contractor (s) or by any such matter or thing whatsoever which under the law relating to sureties would , but for this provision, have effect of so relieving us.
7. The guarantee will not be discharged due to the change in the constitution of the Bank or the contractor (s).
8. We \_\_\_\_\_ lastly undertake not to revoke this (Indicate the name of Bank) guarantee except with the previous consent of the Government in writing
9. This guarantee shall be valid upto \_\_\_\_\_ unless extended on demand by Government  
 Notwithstanding anything mentioned above, our liability against this Guarantee is restricted to Rs \_\_\_\_\_

and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this Guarantee all our liabilities under the Guarantee shall stand discharged.

Dated the \_\_\_\_\_ day of \_\_\_\_\_ For \_\_\_\_\_

(Indicate the Name of Bank)

**Annexure- VI**  
**PROFORMA FOR EARNEST MONEY (BANK GUARANTEE)**  
**FORM OF EARNEST MONEY (BANK GUARANTEE)**

WHEREAS, contractor..... (Name of contractor) (hereinafter called "the contractor") has submitted his tender dated ..... (Date) for the construction of ..... (name of work) (hereinafter called "the Tender") KNOW ALL PEOPLE by these presents that we ..... (Name of bank) having our registered office at ..... (hereinafter called "the Bank") are bound unto ..... (Name and division of Executive Engineer) (hereinafter called "the Engineer-in-Charge") in the sum of Rs. .... (Rs. in words .....) for which payment well and truly to be made to the said Engineer-in-Charge the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this ..... day of .....20.... THE CONDITIONS of this obligation are:

- (1) If after tender opening the Contractor withdraws, his tender during the period of validity of tender (including extended validity of tender) specified in the Form of Tender;
- (2) If the contractor having been notified of the acceptance of his tender by the Engineer-in Charge:
  - (a) Fails or Refuses to execute the Form of Agreement in accordance with the Instructions to contractor, if required; OR
  - (b) Fails or Refuses to furnish the Performance Guarantee, in accordance with the provisions of tender document and Instructions to contractor.

We undertake to pay to the Engineer-in-Charge either up to the above amount or part thereof upon receipt of first written demand, without the Engineer-in-Charge having to substantiate his demand, provided that in his demand the Engineer-in-Charge will note that the amount claimed by his is due to him owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date\* ..... after the deadline for submission of tender as such deadline is stated in the Instructions to contractor or as it may be extended by the Engineer-in-Charge, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE .....

SIGNATURE OF THE BANK

WITNESS .....

SEAL (SIGNATURE, NAME AND ADDRESS)

\*Date to be worked out on the basis of validity period of 6 months from last date of receipt of tender.

**Annexure-VII****OPERATION & MAINTENANCE MANUAL FOR SEWAGE TREATMENT PLANT (MBR)****PROCESS DESIGN BASIS WITH ASSUMPTIONS**

This treatment scheme has been designed to treat the sewage generated from Hospital which is summarized below:-

**RAW SEWAGE CHARACTERISTICS**

Flow	850 m <sup>3</sup> /day
BOD mg/l	200-300
COD mg/l	: 400-550
TSS mg/l :	150-200
Oil & Grease mg/l : 20	Oil & Grease mg/l : 20
pH : 6.5 - 8.5	pH : 6.5 - 8.5
Total Coliform : 106 X 10 <sup>7</sup>	Total Coliform : 106 X10 <sup>7</sup>
Turbidity (NTU) : Not Mentioned	Turbidity (NTU) : Not Mentioned

**TREATED SEWAGE CHARACTERISTICS**

Flow	850 M <sup>3</sup> /day
BOD mg/l	<5
COD mg/l	<20
TSS mg/l	<5
Oil & Grease mg/l	<5
pH	6.5 - 8.5
Ammonia	<1
Total Coliform	Removal to the level of log 6
Turbidity (NTU)	<2

**ASSUMPTIONS:**

- All other pollutants other than mentioned above have been considered as nil at the inlet of S.T.P which exceed the disposal standard as well as will adversely affect the performance of biological treatment.
- Invert level considered is EL – 1.5 mts.
- The plant design does not account for any toxic contamination from industries.
- The plant shall function in anoxic - aerobic condition only.
- Plant is installed in basement.
- We have considered entire sewage will be discharged into the sewage treatment plant in closed pipe. Thus avoiding grid chamber.
- Oil present if any shall be in free & floating form.
- Phosphate, Sulfur is not guarantee in this sewage treatment plant.
- Phase 1 shall have average flow of 35m<sup>3</sup>/hr. and Phase 2 shall have average flow of 35 m<sup>3</sup>/hr. in combination of both the phases the average flow shall be 70m<sup>3</sup>/hr. on 20 hrs basis. However plant shall operate on 24 hrs. of operation (i.e 29.2 m<sup>3</sup>/hr flow rate).
- The sewage generation is for 20 hrs. but plant shall operate on 24 hrs. basis.
- Sample shall be analyzed after every 15 days for 3 months. (i.e. 6 samplings).

12. Minimum 30% flow of rated capacity shall be available for efficient operation of plant.  
 13. Both the phases (i.e. 1 and 2) are considered at same location.  
 14. Clear height requires in basement to install the plant is 7.5 mts.

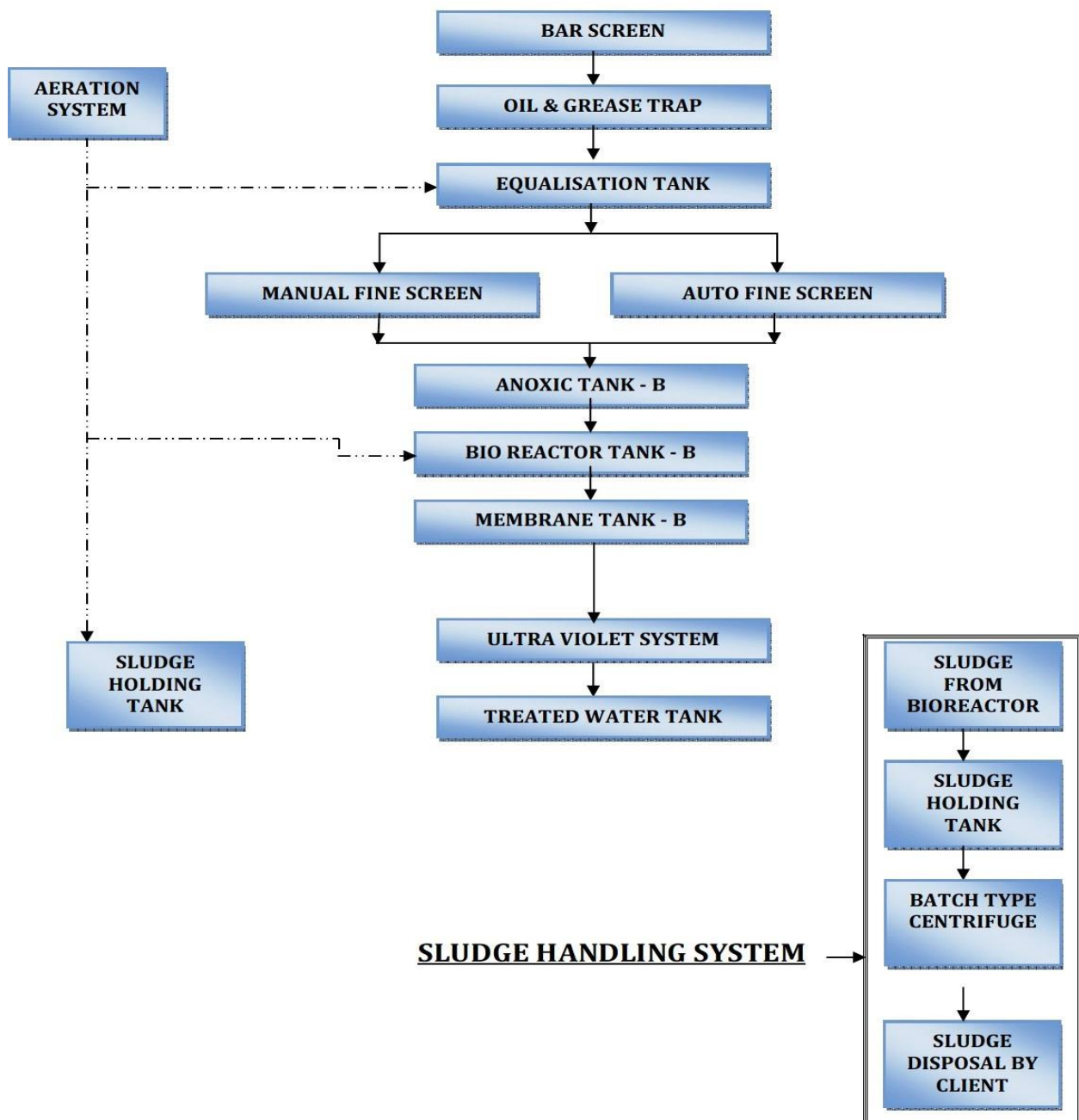
**UNIT DETAILS**

<b>TAG NO.</b>	<b>DESCRIPTION</b>	<b>SIZE / CAPACITY</b>	<b>QTY.</b>
T-1010	Coarse bar screen	0.8 x 1.8 x 0.8M SWD	01 no.
T-1020	Oil & grease trap	5.45 x 1.8 x 1.8M SWD	01 no.
T-1030	Equalization tank	9.4 x 6.5 x 3.5M SWD	01 no.
T-1040A	Fine bar screen-Auto	1.0 x 1.0 x 0.5M SWD	01 no.
T-1040B	Fine bar screen-Manual	1.0 x 1.0 x 0.5M SWD	01 no.
T-1050	Anoxic tank	4.4 x 4.4 x 3.7M SWD	01 no.
T-1060	Bio reactor	8.1 x 10.0 x 3.5M SWD	01 no.
T-1070	Membrane tank (GE MEM)	3.1 x 4.4 x 3.0M SWD	01 no.
T-1090	Permeate tank	4.4 x 4.4 x 3.0M SWD	01 no.
T-1100	Sludge holding tank	2.95 x 2.6 x 3.0M SWD	01 no.
-	Space for centrifuge	Suitable	01 no.

<b>S. No.</b>	<b>DESCRIPTION</b>	<b>MARK</b>	<b>SIZE / CAPACITY</b>	<b>NOS. OFF</b>
1.	Bar screen 6 mm	BS-1010	TL STD.	
2.	Slotted Pipe Oil Skimmer	OS-1020	TL STD	
3.	Air grid – equalization tank	ADG-1030	TL STD	
4.	Diffuser	-	TL STD	
5.	Bio reactor feed pimps	P-1011/12	35.5M <sup>3</sup> /HRO 12MHC	
6.	Fine Screen (Auto) 2mm	BS-1040A	TL STD	
7.	Fine Screen (Manual) 2mm	BS-1040B	TL STD	
8.	Air Blower for EQT, SHT, Bio Reactor	AB-1011/12	650M <sup>3</sup> /HRO4000MM WC	
9.	Air Blower for membrane.	AB-1013/14	450M <sup>3</sup> /HRO4000MM WC	
10.	Agitator for Anoxic Tank.	AG-1050	Suitable	
11.	Air grid for – Bio reactor	ADG-1060	TL STD	
12.	Diffuser	-	TL STD	
13.	Membrane	MEM-1070	Suitable	
14.	Membrane Skid		Suitable	
15.	Sludge recirculation pumps	P-1021/22	143M <sup>3</sup> /HRO10MWC	
16.	Permeate pumps cum backwash pumps with VFD	P-1031/22	38-45M <sup>3</sup> /Hyo10MWC	
17.	Hypo dosing tank	T-1080	150 liters	
18.	Hypo dosing pump	P-1080	6LPH	
19.	U.V. systems	UV-1010	Suitable for 38- 36M <sup>3</sup> /Hyo10MWC	
20.	Air grid sludge holding tank	ADG-1100	TL-STD	
21.	Diffuser	-	TL-STD	
22.	Centrifuge feed pump	P-1041/42	5.0 M <sup>3</sup> /Hyo10MWC	

23.	Centrifuge (Batch type)	CF-1010	45kg per batch solid handling capacity	
24.	DWPE dosing tank	T-1130	100 liters	
25.	DWPE dosing pump	P-1130	0-50LPH	
26.	Agitator DWPE dosing tank	AG-1130	Suitable	
27.	Air compressor for DWE dosing tank	AG-1130	Suitable	
28.	Air compressor with dryer	COMP-1010	2CFM, 7.0MWC	
29.	Hypo dosing tank for maintenance	T-1110	300 liters	
30.	Hypo dosing pump for maintenance	T-1110	150 LPH 2BAR	
31.	Citric dosing tank for maintenance	T-1120	300 liters	
32.	Citric dosing pump for maintenance	T-1120	150 LPH 2BAR	

**PROCESS FLOW DIAGRAM**



## Treatment Philosophy

To treat the sewage the following treatment philosophy is adopted

Bar Screen	: To trap any free floating debris
Oil & Grease removal tank	To trap free & floating oil if any
Equalization tank	To equalize the sewage quantitatively & qualitatively
Fine Screen	To trap any free floating debris above 2 mm
Anoxic Tank	To bring de-nitrification to release the N <sub>2</sub> in atm. By the virtue of bacteria's
Bio-Reactor COD	Treatment of organic matter to reduce BOD / aerobically
Membranes	To filter the treated water from MLSS.
Chlorination and U.V.	For Disinfection
Sludge Holding Tank	For Storage of sludge
Batch Type Centrifuge	: To dewatering of sludge

### Membrane:- ZeeWeed® Overview

The ZeeWeed® membrane filtration system replaces the solids separation function of secondary clarifiers and tertiary sand filters in a conventional activated sludge system. The ZeeWeed® 500 series membrane is a reinforced hollow fiber ultrafiltration membrane with a nominal pore size of 0.04 Qm (Figure 1). The membrane fiber has a tensile strength close to 100 lbs and is highly resistant to chemicals, including acids, bases and chlorine, which are used for membrane cleaning. This membrane is designed specifically for high solids applications such as membrane bioreactors. The membrane is manufactured and assembled into discrete units called “modules”, (Figure 3). These are the basic building blocks of the membrane system that are manifolded together to create a “cassette”. The ZW500d cassette (Figure 4), which is proposed can contain up to 48 modules. Each module has 370 ft<sup>2</sup> of membrane area, for a maximum membrane area of 17,760 ft<sup>2</sup> per cassette. Cassettes may also be partially filled with a minimum of 24 ZeeWeed® modules. The 500d cassette is Seller's latest generation of proven ZeeWeed® 500 membrane configuration.

### Off, Permeation and Stand-by Modes off Mode

In OFF mode, devices are off. However, for membrane protection, the first two steps in OFF mode are to ensure the membranes are submerged. This is done by opening the feed valves. When the water level is above the membranes the feed valves are closed. The last step in OFF mode has all equipment associated with the train in positions programmed in the PLC; these devices cannot be manually or automatically controlled.

### Filtration/Production/Permeation Mode

Filtration, or permeation, consists of drawing clean water from the mixed liquor through the membrane fibers via the permeate pump. Water is produced from each train during the filtration period for a duration of 11 minutes, followed by a 30 second relaxation/ backpulse. The filtration duration cycle is based on GE's extensive experience with the numerous GE's MBRs in operation throughout the world. There is permeate/process pump per train with 50% standby pump for filtration purposes. The vacuum generated by the permeate pump draws permeate from the outside-in through the membranes and discharges it to the Permeate Storage Tank. The variable speed pumps are controlled by GE's supplied PLC to maintain the permeate-flow demand. The PLC continuously runs a PID loop for Trans Membrane Pressure (TMP) while in production. The PLC uses the lower of the control outputs from the flow loop and TMP loop. All the permeate pumps are controlled at the same flow set points and are complete with premium efficiency VFD rated motors and discharge flow meter. Maximum pump capacity for permeation is achieved at the highest design level in the process tanks. All pump speeds will gradually decrease as the liquid level in the process tanks decreases. If during low flow conditions this level drops below the design minimum, and the pumps cannot be slowed down any further, one or more trains will automatically go into standby mode. During or below average day flow conditions, all Two



(2) trains will be in operation provided any trains are not required to go into stand-by mode. All permeate pumps and Mixed Liquor RAS pumps will be operating. All permeate pumps will discharge into a common permeate collection header. The Permeate Storage Tank and the Backpulse Tank are both fed from the common permeate header. Cleaning and Maintenance Procedures As the feed is drawn through the membranes during filtration, solids are removed which accumulate on the membrane surface. As the solids accumulate, they restrict the flow through the membranes and eventually membrane cleaning is required in order to maintain the filtered water flow rate. Membrane cleaning is absolutely critical to ensure sustainable operation over the life of the plant regardless of membrane type. GE's MBR system is designed with the most comprehensive cleaning toolbox, which represents the culmination of years of experience in long-term MBR operation for uncompromised performance over the life of the membranes. Features include the following:

- **Membrane Air Scouring:** used as a mechanical cleaning action, Seller has developed and patented the most energy efficient membrane air scouring method in the industry.
- **Relax mode**
- **Back pulse Ability:** The ability to ensure an even distribution of chemicals across the fibers through back pulsing under pressure. This reduces the potential for preferential flow of cleaning chemicals.
- **Cleaning:** The ability to clean not only the inside of the membrane surface with maintenance cleaning, but also the outside of the surface with recovery cleaning. Ability to clean quickly and easily through fully automated processes such as relaxation, back pulsing, maintenance and recovery cleaning; and GE's multilevel approach to maintaining membrane performance is summarized in the following sections.
- **Membrane Scouring by Aeration**

Whenever a membrane train is in production, membrane scour aeration is required to maintain consistent permeability of the membrane. Specially designed highly efficient coarse bubble aeration is used to scour the outside surface of the membrane and move mixed liquor solids away from the membrane fibers. This is accomplished by a Seller's patented cyclic aeration system that uses a factory installed coarse bubble aeration grid which is integrated into the base of each ZeeWeed® 500d cassette.

The membrane cassette is aerated to provide a mechanical cleaning action. This air scour removes foulants that may deposit on the outside of the fiber, maintaining membrane permeability. The aeration also minimizes the effect of concentration polarization which is recognized as a significant membrane fouling mechanism. The system has been designed to supply Air to each air header of a membrane train at 10 seconds ON and 10 seconds OFF (10:10) aeration mode. Based on GE's experience in various MBR systems, a 10-30 aeration mode will be operated during normal operation of the plant resulting in overall decreased aeration energy consumption. The process is PLC-automated and provide among the lowest MBR energy consumption in the industry without sacrificing any performance.

### **Relaxation**

Relaxation mode combined with air scouring is the routine cleaning mode during normal production. The combined stoppage of permeation and air scouring effectively removes solids that have accumulated on the membrane surface or within the fibers and reduces electrical costs. While operating in relaxation mode, permeation for each train is stopped sequentially for a short period of time (30-60 sec) every 10-12 minutes to allow air scouring of the membranes without permeation. No chemical or permeate is used during relaxation mode. This is the normal operating mode of ZeeWeed® MBR systems. The relaxation function is fully automated by the PLC with no operator intervention.

### **Back pulse or Backwash**

Backpulsing is a cleaning tool which allows for reliable system performance during unexpected influent or process operating scenarios. Backpulsing involves reversing the flow through the membranes to dislodge any particles that may have adhered to the membrane surface. As with relaxation, the backpulse

functionality is fully automated by the PLC with no need for operator intervention. The backpulse system has also been incorporated into the automated membrane cleaning systems included in the proposed design. Backpulsing is particularly critical for efficient membrane cleanings. Without backpulse, deep chemical cleaning of membrane pores is impossible for any type of membrane, and can run the risk of membranes becoming deeply and irreversibly fouled with organic matter. The backpulse tank is automatically filled with permeate which is used for the backpulse process. If required, hypochlorite may be added to the backpulse tank to maintain a concentration of < 5.0 mg/L to prevent bacterial growth.

### **Maintenance Clean**

Over time, the membranes can experience fouling caused by accumulation of organic matter or crystallized salts within the membrane fiber pores. Cleaning of the membranes in this circumstance to restore the permeability requires use of a Clean-In-Place system. Clean-In-Place (CIP) membrane cleaning is a standard operational procedure for most membrane systems including the ZeeWeed® system. A maintenance clean is a regularly scheduled, fully automated cleaning that involves an extended backpulse combined with low concentration of chemical addition. Maintenance cleans are intended to maintain membrane permeability and extend the time between recovery cleans. The maintenance cleaning procedure is entirely automated and will be scheduled to occur during off-peak hours of the day. The ZeeWeed® membrane filtration system includes the capability to perform maintenance cleans using sodium hypochlorite (NaOCl) and citric acid to target organic and inorganic foulants respectively. The maintenance cleaning procedure incorporates the following features:

- Fully automated;
- Performed without draining the membrane tank;
- Low chemical concentration.

Maintenance clean consists of a series of short backpulses with chemical solution, followed by a backpulse with only permeate to flush the headers and membranes.

**Table below provides anticipated cleaning frequency and chemical dosing concentration**

<i>Maintenance Cleaning</i>	<i>Sodium Hypochlorite</i>	<i>Citric Acid</i>
<b>Frequency</b>	2/Week	1/Week
<b>Chemical Concentration</b>	200 mg/ltr	2000 mg/ltr

### **Recovery Clean**

Recovery cleaning is required to restore the permeability of the membrane once the membrane becomes fouled. The recovery cleaning procedure consists of a chemical backpulse sequence, followed by a chemical soak period.

**Key features of the recovery cleaning procedure for ZeeWeed® MBR are:**

- Fully automated once initiated by the operator;
- Cleans all membrane cassettes in a train at the same time;
- Requires moderate chemical concentration
- Thoroughly cleans the surface of the membrane

Table below provides anticipated recovery cleaning frequency and chemical dosing concentration.

<i>Recovery Cleaning Sodium Hypochlorite Citric Acid</i>	<i>Recovery Cleaning Sodium Hypochlorite Citric Acid</i>	<i>Recovery Cleaning Sodium Hypochlorite Citric Acid</i>
<b>Frequency</b>	2/Annum	1/Annum
<b>Chemical Concentration</b>	1000 mg/ltr	2000 mg/ltr

#### **Advantages of the new Z-weed™ - Module:**

- Absolute separation of bacteria and suspended solids
- Separation of adsorbed viruses
- Resistant to clogging e.g. with hairs and fibers or sludge
- High packing density due to self-supporting membrane sheets
- Efficient use of surface area by a hydro - dynamically optimized design
- Effective membrane cleaning with permeate

The characteristic of the MBR process is the use of revolutionary submerged membranes in the biological process water tank, so as to produce high quality permeate from domestic sewage, primary and secondary waste water, cooling tower blow down etc. The new Z-weed™ is also ideal for retrofitting/augmenting capacity/quality of existing wastewater plants. The MBR can handle very high sludge concentrations in the aeration tank because of which the size of the aeration tank reduces four to five folds. As the membrane acts as a fine filter, it does not require any further treatment using sand filters, activated carbon filters, etc. The new Z-WEED™ MBR is available in standard and customized modules. Activated sludge in the aeration tank is clearly removed by the submerged membrane. The membrane module consists of housing, aeration diffuser, permeate water manifold and membrane elements. The membrane element consisting of flat sheet membranes sandwiching a support panel is set up vertically. Feed water including activated sludge is filtrated by hollow fibre membranes with pore size of 0.04 micron meter. The air bubbles supplied from the bottom of the membrane elements continuously scour off cake of activated sludge accumulated on the membrane surface. This is continuous filtration operation. The air bubbles are also used for the biological reaction to decompose organic substances included in the raw sewage.

The material of the membrane is PVDF which has high stability for chemicals and good physical strength. The form of membrane is fiber reinforced flat sheet membrane. The membrane has small and uniform pore size. Therefore, the rejection property of this membrane is excellent. Almost all particles with sizes more than 0.04 micron meter can be removed effectively using this membrane.

#### **PRE COMMISSIONING CHECKS**

Before a new plant is put under operation, it is necessary that all operation and maintenance personnel understand the function and location of each process unit, mechanical equipment and piping.

#### **Following checkups should be made before the commissioning of the Sewage treatment plant.**

Check all the internals of Bio Reactors i.e. Inlet /outlet nozzles, air grids, air grid supports etc.

- Direction of the flow is marked clearly on the pipes.
- All the mechanical equipment is tested and are in good working condition properly lubricated.
- All the civil tanks are tested for leakages.
- All the tanks and piping are clean and free of debris.
- All the process units and mechanical equipment should be tested with water for the normal operation of each unit and hydraulic system. Only after this, wastewater should be introduced to the system.

- All the lights, meters, indicators, etc. are operational.
- Check all lines for leaks. Any repairs needed are easier to make before wastewater is added.
- Operation and maintenance manual have been read by the operators and stored in one location for ready reference.

### **PLANT STARTUP MECHANICAL START-UP**

Before starting the plant trials on full load, it is essential that mechanical performance of the equipment have to be established to ensure their proper functioning when effluent is taken in. To achieve these following steps should be observed –

#### **No load runs of motors**

This is carried out to ensure that the motors are running smoothly without any problems either in their bearings or in stator - rotor combination. To carry out this activity, disconnect the coupling pins/valves from the driven equipment. Then the motors are kick started and stopped to observe their direction of rotation. If the direction is not as required by the driven equipment, then reverse the phase connections. The motors are once again kick started to ensure the required direction of rotation. After ensuring the direction of rotation, no load run shall be carried out for 4 to 8 hours depending on their ratings. If the motors capacities are of smaller size then there is no need of going for no load test. During the no-load run, current drawn by motor, vibration, noise and bearing temperature shall be observed and noted. If all these readings are within limits, then motors are coupled with driven equipment for further step. Otherwise, possible causes for defects should be found out and rectified as given in Motor Manuals.

#### **On Load Trial (With Clear Water)**

The effluent normally has density equal to density of water. It, thus, suffices to run these on clear water for sufficient time to prove the adequacy of mechanical equipment. This is done as follows: All tanks in which equipment is supposed to run on load are filled up with clear water. Lines are flushed with water. Then the respective equipment are run as mentioned below:

### **PUMPS**

Open suction valves in pump suction. Start the pump with delivery valve closed. Open the valve slowly observing the pressure gauge so as to set the delivery pressure to design limit. The pump will thus be running at designed duty point. Allow the pump to run. It will run for the duration, which will be determined by capacity of holding tank and pump for rate, unless fresh water is fed into holding tank. During this period observe motors temperature; pump bearing temperature, vibration, noise, etc. In case of any problems, study/follow the equipment manual enclosed.

### **BLOWERS**

Close the discharge valve. Open vent valve fully Start the Blower  
Open the discharge valve gradually Close the vent valve gradually.

### **COMMISSIONING / OPERATION**

The supplied plant has two different stages of treatment.

- Primary Treatment

The primary treatment basically involves physical treatment like screening and oil & grease removal.

- Secondary Treatment

The secondary treatment is a biological process where the major COD & BOD, nitrogen reduction takes place. The biological treatment provided in this plant is in the Aeration tank - Bio Reactor which is suspended growth process. After the biological treatment there is an MBR tank where Z- weed membranes are installed, the biologically treated water passes through these hollow fibre membrane cassettes to produce clear treated sewage which conforms to the design standards based on the inlet effluent parameters UV system also provided which helps in disinfection. The treated sewage from the permeate tank is further transferred to the RO systems which are detailed in the subsequent chapters.

### Culture Preparation

The culture preparation is a critical and long drawn process. This is the main activity of commissioning and has to be done very carefully. It takes around 10-15 days for the culture preparation and another 7 days for stabilization. The procedure has been explained below on day to day basis. Culture development & commissioning of Bio Reactor

a) Day-1-

Start the Feed pump at Equalization Tank & fill the sewage in the Bio reactors up to 25% volume of Bio reactor. Start the Air Blower & Supply the air to reactors through air grids supply of air should be kept on continuously.

b) Day-3

Fill each Bio reactor up to 50% of its volume. Keep the air on, if the sewage is lean, add nutrients in form of DAP, Jaggery.

c) Day-5

Fill the Bio reactor up to 75% of its volume. And follow the same procedure as for the 3rd day.

d) Day-7

Fill the Bio reactor up to 100% of its volume i.e. upto outlet level. And follow the same procedure as for day 5

e) Day 8, 9, 10

Keep the air continuously on, the culture will should get developed by 10th or 12th day. This can be checked with the level of MLSS with help of measuring cylinder.

f) Day -12,13

Start feeding the sewage to the Bio reactor at 25% of hourly flow rate. g) Day-14,15

Increase the sewage feed rate to 50% of hourly flow rate. h) Day-16,17

Increase the sewage feed rate to 75% of hourly flow rate. i) Day-18,19

Increase the sewage feed rate to 100% of hourly flow rate & keep on running the plant at this rate. After completion of the above period and culture development activity the water will over flow into the downstream system, When the sewage is to be taken into the membrane tank, the MLSS level should be atleast 6000.

### CENTRIFUGE MACHINE

A centrifuge is most often used for the separation of particles from solutions according to their size; shape, density, viscosity of the medium and rotor speed. These machines utilize the natural separation realities present in a high-speed circular G-force environment. Like a high-powered clothes dryer, these exceedingly fast machines spin in order to separate materials from one another. The denser materials separate from the less dense during the centrifugation process. This is helpful for the cleaning and separating of slurries, which are present in many industries. The dairy industry uses centrifuges to separate milk from whey, and the food and beverage industry uses them for the washing of edible oils and the clarification of wine and juices. Centrifuges vary in size and power depending on the substances involved in the process. Some are able to run continuously, feeding in slurry to be separated and sending the divided substances through to outside chambers to be removed. Sometimes centrifuges are used as a step in a larger filtering process or system. Basket centrifuges work by a process in which the liquid/solid slurry is fed into the rotating basket with a filtering cloth on the slotted jacket. The liquid passes the cloth and solid is left on the basket walls. When the basket is full of material, the machine speed is decreased and the solid is scraped from the walls of the machine. The washing and cleaning of metal parts can also take place inside in what is considered an industrial centrifuge, as washers are put in a bath of cleaning solvent and then run at gforce speeds, both cleaning and separating the excess and sludge from the metal. The dairy, wine, beverage, and edible oil and fat industries also use industrial centrifuges for the degumming and purification of their respective products. Power and wastewater plants use centrifuges for the separation and cleansing of fuels and lubricants. The industrial sectors of society, such as wastewater treatment plants, use centrifuges extensively for the clarification of wastewater. Power plants use them for the purification of fuel and lubricants as well as for the cleansing of metal parts, using the centrifuge

like a washing machine of sorts. The primary use of centrifuges is done by the chemical, biotechnical and pharmaceutical sectors of society. They use small laboratory centrifuges for the analyzing of proteins and drugs, and they use larger centrifuges for the purification of solvents and the concentration of other biomasses. Many of the manufacturers of centrifuges specialize in one type, e.g. laboratory or industrial, yet others do design a wider range of types. Custom work with the manufacturer is possible in order to achieve best results. The manufacturer will work with the customer to build a proper centrifuge for his or her needs, based on the materials, the volume and feed rates necessary and any cost limits. Many shops also deal in the distribution and maintenance of used centrifuge units. These may be a more cost effective way of purchasing a new or replacing an old centrifuge beyond repair capabilities.

### **UV SAFETY INSTRUCTIONS**

**WARNING-** to guard against injury, basic safety precautions should be observed, including the following:

1. Read and follow all safety instructions.
2. Danger- To avoid possible electric shock, special care should be taken since water is present near electrical equipment. Unless a situation is encountered that is explicitly addressed by the provided maintenance and troubleshooting sections, do not attempt repairs yourself. Instead, please contact our technical support division.
3. Carefully examine the water sterilizer after installation. It should not be plugged in if there is water on parts not intended to be wet.
4. Do not operate the water sterilizer if it has a damaged cord or plug, if it is malfunctioning or if it is dropped or damaged in any manner.
5. Always disconnect water flow and electrically unplug the UV system before performing cleaning or maintenance activities.
6. Do not use this UV disinfection system for any other purpose other than disinfection of water. The use of attachments not approved, recommended or sold by the manufacturer / dealer may cause an unsafe condition.
7. Intended for indoor use only. Do not install this UV disinfection system where it will be exposed to the weather or to temperatures below freezing. Do not store this system where it will be exposed to the weather. Do not store this system where it will be exposed to temperatures below freezing unless all water has been drained from it and the water supply has been disconnected.
8. If an extension cord is necessary, a cord with a proper rating should be used. A cord rated for less Amperes or Watts than the UV system rating may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled. Congratulations on choosing the EcoStream range of ultraviolet systems from Alfa UV. Each unit is designed to provide safe, reliable disinfection performance year after year with minimal maintenance.

### **OVERVIEW**

Each UV system is designed to treat water at specified flow rates as outlined in the specification sheet. All EcoStream units are provided with two main component parts, specifically the ultraviolet reactor chamber and the main controller.

#### **Reactor Chamber**

The reactor chamber is manufactured from stainless steel 316L and houses the ultraviolet lamp and quartz sleeve. All EcoStream UV systems use only a single UV lamp. The lamps used in the Alfa EcoStream Models ECS60R - ECS150R are of a special high intensity, high output germicidal type. The chamber is designed to mount both horizontally or vertically and should be secured to a suitable support.

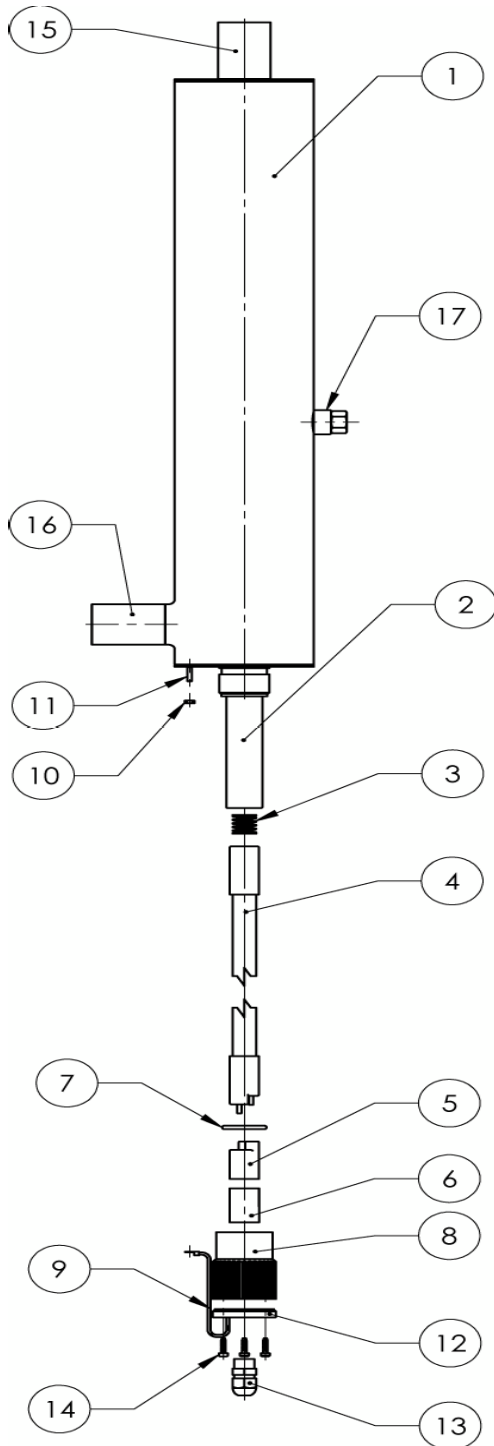
#### **Control Panel**

The main controller is made of aluminum. The controller is connected to the chamber via 2 meters of cable to allow for application flexibility. The panel can be mounted either horizontally or vertically on the wall.

**Standard Electronics**

1. All EcoStream control boxes are equipped with a soft start on/off switch. When the main power to the system is turned on, the lamp will turn on directly. However, if required, the lamp can be turned off (and subsequently on) by using holding down the "power" button on the EcoStream Control box for 2 seconds.
2. A separate user accessible fuse is also provided as protection for the electronics.
3. A seven segment LED display monitors the remaining number of useful hours of the UV lamp (Time Elapse Meter) and the days the UV system has been in operation.  
An audio-visual "Lamp Life Over" and "Lamp Failure" indicator

### REACTOR CHAMBER COMPONENTS DIAGRAM



Sr. No.	Description	Qty.
1	UV Reactor	1
2	Quartz Sleeve	1
3	Lamp Centering Spring	1
4	UV Lamp	1
5	Lamp Connector	1
6	Lamp Locator	1
7	Quartz Sealing O-ring	1
8	Quartz Compression Nut	1
9	Earthing Wire	1
10	Earthing Nut	1
11	Earthing Stud	1
12	Sealing Nut End Cover	1
13	Cable Gland	1
14	End Cover Screws	3
15	Reactor Inlet	1
16	Reactor Outlet	1
17	Drain / UVM Port	1



**PRODUCT APPLICATION**

Ultraviolet disinfection provides a simple, inexpensive way of destroying bacteria, mold, virus, algae and fungi without the use of heat or chemicals. Each EcoStream system is designed to achieve a specific energy dose to properly destroy microorganisms. The dosage which applies to ultraviolet disinfection is proportional to energy, time, and area. The total UV energy is attributed to the amount of energy emitted from all sides of a UV lamp and is expressed in micro watts. The exposure is expressed in seconds and represents the total time it takes for the water to flow through the UV chamber. The final factor in determining the dosage relates to the total area and is expressed in centimeter squared. To summarize, the total dosage is expressed in QW-sec/cm<sup>2</sup> or micro watt second per centimeter squared. UV Disinfection is affected by many factors and the following should be looked at prior to the installation of the UV system:

1. UV Transmission (transmittance) deals with the effectiveness in which the 254 nanometer wavelength of ultraviolet light is transmitted through the water. The higher the transparency of the water, the more effective the UV system becomes. This optical clarity is evaluated by performing a test which passes incident light through a 1 cm depth of water and recording this against the same test using distilled water as a reference. This is done using a spectrophotometer. The basic designs of the units have taken into account a typical transmission at the desired wavelength. In practical terms this means that a system designed to disinfect a flow of about 3 m<sup>3</sup>/hr (e.g. ECS60R) at a typical transmissibility (98%), could actually have a lower flow rate in liquids with a lower transmissibility. As a general guideline, the following are some typical UV transmission rates:

Deionized or reverse osmosis water: 90 - 98% Typical filtered fresh water: 90 - 94%

Lakes, wells, or other private sources: 70 - 90% Other liquids (constituent dependant) : 0 - 95%

**\*\*\* WARNING -- DO NOT UNDERSIZE UNITS \*\*\***

1. If exact transmission quality needs to be determined, have samples tested at a suitable lab using a proper spectrophotometer. Alternatively, you may contact Alfa UV for a sample analysis.
2. Suspended Solids will act against a UV system by effectively shielding microorganisms from the ultraviolet light. Dirt, rust, turbidity, etc. all have the ability to block out the UV light. It is absolutely necessary to properly control the level of suspended solids by properly pre- filtering the liquid prior to disinfection (pre-filtration down to 5 micron is considered the minimum).
3. Total Dissolved Solids of around 500 ppm can drastically reduce the rated flow rate of the unit by absorbing UV energy. Proper pretreatment of high TDS levels must be taken into account.

**WARNING: SUDDEN OPENING OF THE INLET FLOW MAY SERIOUSLY DAMAGE**

## UV LAMPS OR QUARTZ SLEEVES

### MAINTENANCE

The basic unit is designed to operate with minimal maintenance requirements providing the minimum water characteristics are met as are outlined in the section "Application Guidelines". However there are two regular maintenance requirements common to all UV systems: cleaning and lamp replacement.

### Cleaning

Minerals in the water will eventually coat the quartz sleeve (which protects the lamp), as well as the sensor (if the system is equipped with one). This coating reaching the water, thereby reducing disinfection performance. Once a month, check the sleeve and clean it if you can see a mineral coating starting to form. If sleeve requires cleaning, refer to Lamp Replacement instructions but re-install the original lamp. If system is equipped with a sensor, be sure to also clean the sensor each time the sleeve is cleaned.

### Quartz Sleeve Replacement/Cleaning

Please cross reference the numbers in brackets [] with the reactor component diagram provided.

1. If the lamp is in the system, remove the lamp and carefully set it aside as described in the lamp installation/replacement section.
2. Shut off the upstream water supply that feeds water into the reactor chamber. Depressurize and drain the system by disconnecting the inlet/outlet from the reactor chamber.
3. Unscrew and remove the QG sealing nut [8] from the top of the reactor. Make sure to remove the QG sealing O-ring [7] and keep it carefully.
4. Carefully slide the sleeve out of chamber. In case it is initially tight, gently try rotating the QG while also pulling it out. Also make sure that the sleeve is not at an angle as otherwise pressure will be applied on the sides of the sleeve and against the reactor chamber causing the sleeve to fracture.
5. Clean the quartz sleeve, or replace them with a new one. To clean the sleeve, use a mild acid solution such as 10% Citric Acid or household cleaners such as vinegar.
6. Reinstall the quartz sleeve in reverse order. Carefully slide the quartz sleeve into the reactor through the QG socket until it is locked into place in the internal QG holder. Ensure that the sleeve is inserted straight and not at an angle as doing so will put pressure on the wall of the sleeve and can cause it to crack. Install the quartz sealing o-ring [7] onto the sleeve until it rests against the QG socket.
7. Reinstall the QG socket compression nuts [8] by turning clockwise. This nut should be hand tightened only.
8. Slowly turn on the water and pressurize the reactor to verify that there are no leaks.
9. Reinstall the lamp as described in the lamp installation/replacement section and reconnect all the electrical connections to ensure that the system is operating properly.

### Lamp Replacement

The UV lamp intensity decreases over time. The UV lamps used in the Alfaa EcoStream Models ECS60R - ECS150R are rated for approximately 9,000 hours of continuous use (approximately one year). Replace the lamp after this time frame. The built in "Lamp Life Remaining" counter and "Replace Lamp" reminder aids in this task by continually monitoring the running time of the unit.

### Lamp Installation/Replacement

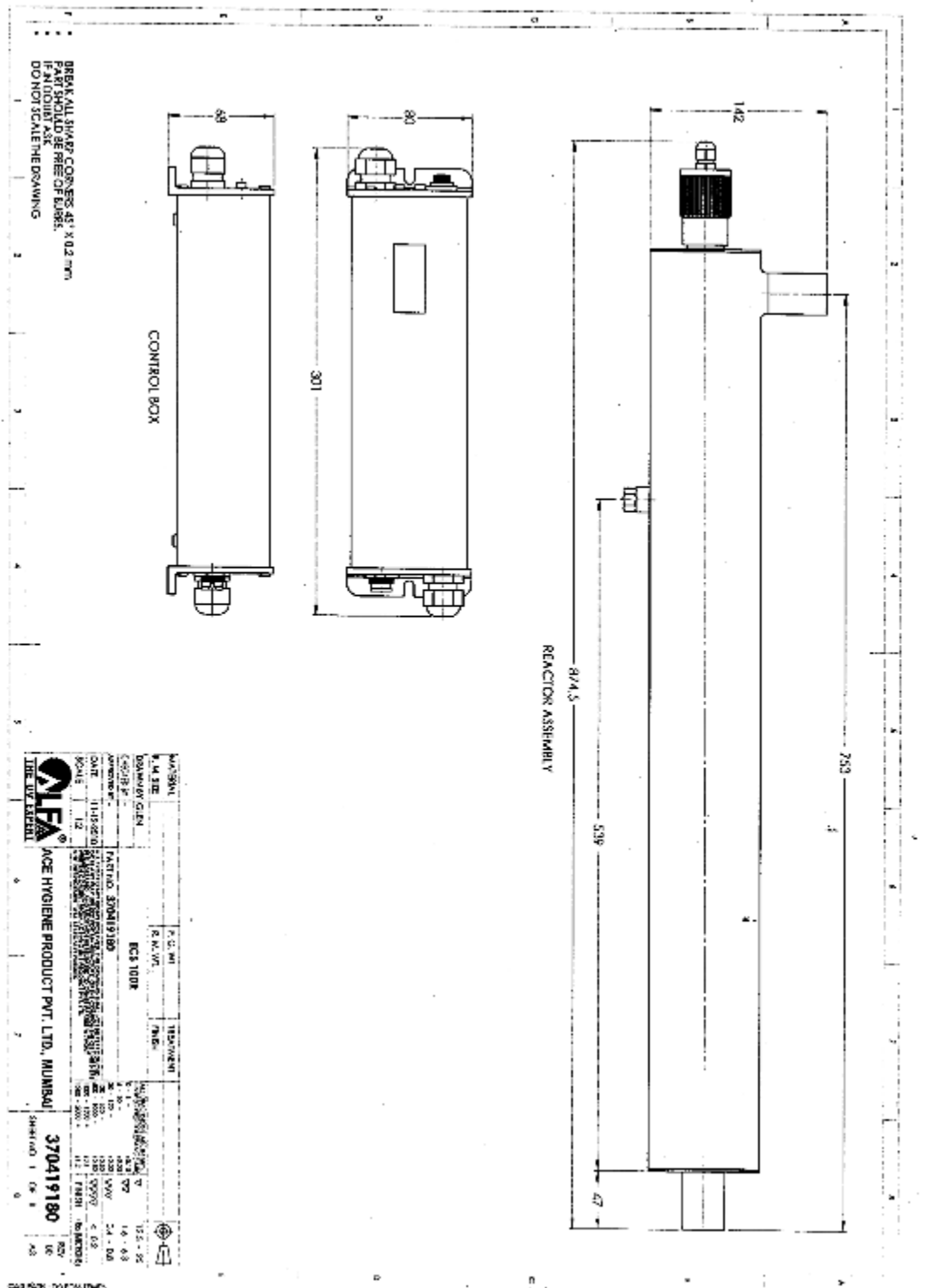
Please cross reference the numbers in brackets [] with the reactor component diagram provided.

1. To replace the lamp, there is NO need to disconnect the system from the water supply, or to drain the water from the reactor chamber. Lamp replacement is easy requiring no special tools. The UV lamp must be replaced after 9,000 hours of continuous operation in order to ensure adequate disinfection.
2. Disconnect the main power source and allow the unit to power down. From the side where the lamp connections are made, disconnect the earthing wire [9] from the earthing stud [11] on the reactor and

then unscrew the QG socket end cover screws [14].

3. Now gently pull out the lamp harness and extract the lamp connector [5] and UV lamp [4] from the UV reactor [1]. Once you can visually see the lamp, separate the lamp from the connector by pulling them apart. Do not try twisting the connector as it will break. While it is OK to touch the ceramic ends of the lamp, avoid touching the UV lamp "glass" with your fingers. Wipe off any oils with alcohol and a soft cloth. Warning: Depending on when the system was powered down the UV lamp might still be very hot. In this case please take care by using gloves or other protective gear.
4. Carefully remove the lamp from the reactor chamber taking special care not to angle the lamp as it is removed. If the lamp is removed at an angle, pressure will be applied on the inside of the quartz sleeve, causing the sleeve to fracture and break.
5. If the QG is going to be removed then also remove the lamp centering spring[3].
6. To install a new lamp, first remove the lamp from its protective packaging again being careful not to touch the lamp "glass" itself. Before inserting the lamp into the reactor vessel (actually inside the quartz sleeve) make sure that the lamp centering spring [3] is inserted into the quartz sleeve in the reactor. Now, insert the lamp fully into the chamber (with the pins on the connection side) leaving about two inches of the lamp protruding from the chamber.
7. Secure the lamp connector [5] on the UV lamp [4] ensuring that the connector is fully seated onto the pins. Finally, screw the socket cover [12] back onto the QG socket compression nut using the provided screws [14].
8. Connect the earthing wire [9] to the earthing stud [11] on the UV reactor using the provided earthing nut [10]. The system may now be powered up and tested.

**5.2 GA Drawing**



## ALFAA UV : ECS SERIES SPECIFICATIONS

Model No		ECS02L	ECS05L	ECS08L	ECS12L	ECS30L
Flow Rate @ 95% UVT EOL	US Public Health - 16 mJ/cm <sup>2</sup>	0.2 m <sup>3</sup> /hr	0.5 m <sup>3</sup> /hr	0.75 m <sup>3</sup> /hr	1.4 m <sup>3</sup> /hr	2.5 m <sup>3</sup> /hr
	<b>AUV Standard - 30 mJ/cm<sup>2</sup></b>	0.12 m <sup>3</sup> /hr	0.3 m <sup>3</sup> /hr	0.5 m <sup>3</sup> /hr	0.75 m <sup>3</sup> /hr	1.7 m <sup>3</sup> /hr
	NSF / EPA - 40 mJ/cm <sup>2</sup>	0.1 m <sup>3</sup> /hr	0.2 m <sup>3</sup> /hr	0.5 m <sup>3</sup> /hr	0.5 m <sup>3</sup> /hr	1.2 m <sup>3</sup> /hr
Dimensions	Reactor (LxH)	375x85 mm	375x90 mm	493x90 mm	493x101 mm	720x105 mm
	Control Panel	213 x 168 x 60 mm	213 x 168 x 60 mm	213 x 168 x 60 mm	213 x 168 x 60 mm	213 x 168 x 60 mm
Inlet / Outlet Size		1/4" BSP (F)	1/2" BSP (M)	1/2" BSP (M)	3/4" BSP (M)	3/4" BSP (M)
Electrical	Voltage	230V / 50-60Hz	230V / 50-60Hz	230V / 50-60Hz	230V / 50-60Hz	230V / 50-60Hz
	Power Consumption	13 W	22 W	27 W	27 W	40 W
Maximum Operating Pressure		75 psi	75 psi	75 psi	75 psi	75 psi
Total Running Time Counter		Optional	Optional	Optional	Optional	Optional
UV Intensity Monitor		n/a	n/a	n/a	n/a	n/a
Chamber Material		SS304	SS304	SS304	SS304	SS304



### Technical Specifications Sheet

Model	ECS60R	ECS100R	ECS150R	ECS250R	ECS310R
US Public Health - 16 ml/cm <sup>2</sup>	6	11	15	25	25
AUV Standard - 30 ml/cm <sup>2</sup>	3.4	6.2	8.9	15	18.5
NSF / EPA - 40 ml/cm <sup>2</sup>	2.6	4.7	6.7	11	13.5
Reactor (LxH)	582x155 mm	834x155 mm	1033x155 mm	1150x175 mm	1150x175 mm
Control Panel	250 x 75 x 60 mm	250 x 75 x 60 mm	250 x 75 x 60 mm	300 x 150 x 120 mm	300 x 150 x 120 mm
Inlet / Outlet Size	1" BSP	1" BSP	1.5" BSP	2" BSP	2" BSP
Electrical	Voltage	220-240V / 50-60Hz	220-240V / 50-60Hz	220-240V / 50-60Hz	220-240V / 50-60Hz
	Power Consumption	55	74	110	195
	Lamp Power	48	70	95	172
Maximum Operating Pressure	100 psi	100 psi	100 psi	100 psi	100 psi
Ambient Water Temperature	4-40°C	4-40°C	4-40°C	4-40°C	4-40°C
Total Running Time Counter	Yes	Yes	Yes	Yes	Yes
Lamp Life Remaining Counter	Yes	Yes	Yes	Yes	Yes
Lamp Replacement Reminder	Yes	Yes	Yes	Yes	Yes
UV Intensity Monitor	Optional	Optional	Optional	Optional	Optional
Chamber Material	SS316L	SS316L	SS316L	SS316L	SS316L
Control Box Material	Aluminum			M.S. Powder Coated	



## Immersed Hollow Fibre Filtration Cassette ZeeWeed<sup>®</sup> 500d-48

### Cassette Specifications

Permeate connection size	4" pipe vertical branch or 8" pipe horizontal
Typical cassette shipping weight	1201 kg (2648 lb)
Typical cassette shipping weight including crate	1561 kg (3442 lb)
Typical wet cassette weight †	1450 kg (3197 lb)
Displaced volume during MIT	290 L (77 gal)

Standard cassette configuration is 48 modules. Number of modules may be reduced in increments of 4. Frame size remains unchanged

† Wet cassette weight does not include any accumulation of solids during operation.

### Aeration Specifications

Maximum air temperature: 65°C (150°F)

The aeration manifold consists of two parallel channels which can be operated alternately with 2 x 3" pipe connection for intra-cassette cycling or simultaneously with 1 x 4" pipe connection for whole cassette cycling.

	Sequential (within cassette)	Cyclic (whole cassette)
Air connection size	2 x 3" pipe	1 x 4" socket
Maximum instantaneous air flow*	425 dm <sup>3</sup> /hr (250 dcfm)	850 dm <sup>3</sup> /hr (500 dcfm)
Minimum instantaneous air flow*	270 dm <sup>3</sup> /hr (160 dcfm)	540 dm <sup>3</sup> /hr (320 dcfm)
Aerator pressure loss @ maximum air flow (excluding hydraulic head)	0.05 bar 0.8 psig	0.05 bar 0.8 psig

\*Air flow depends on application consult design manual for specific requirement  
dcfm = cubic feet per minute at point of discharge (aerator submergence)  
dm<sup>3</sup>/hr = cubic meters per hour at point of discharge.

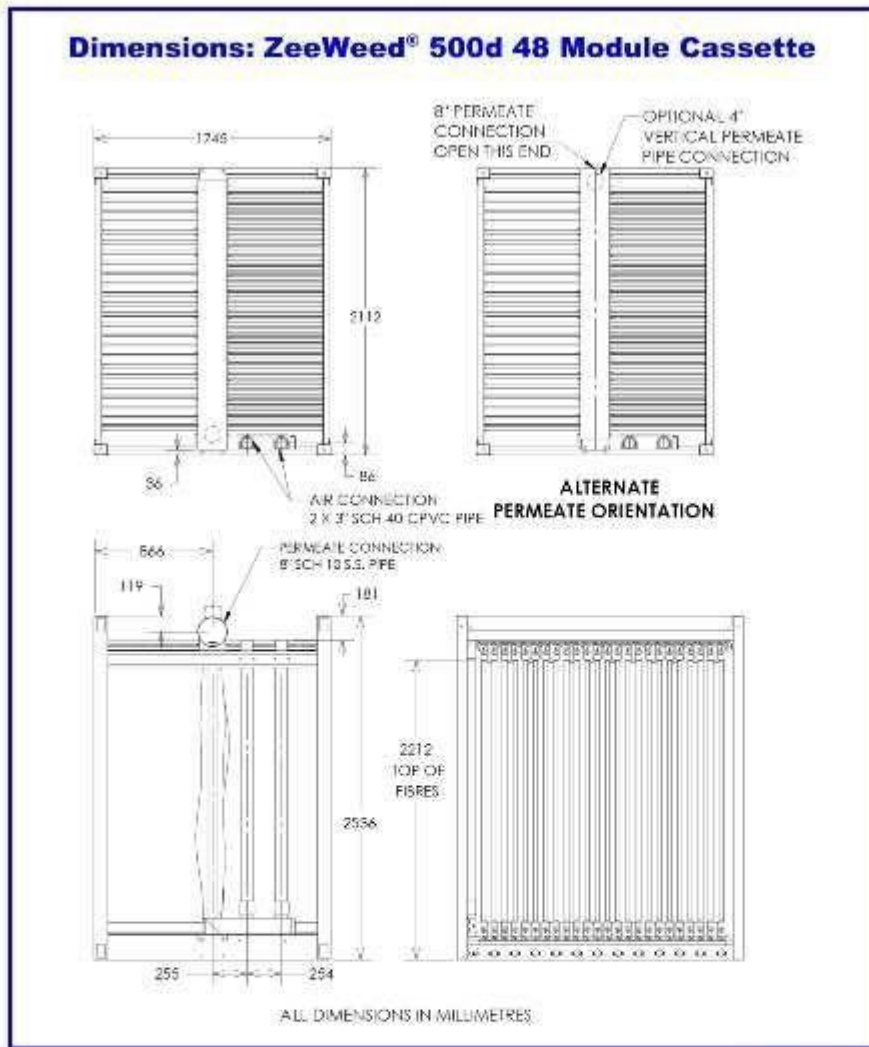
### Operating Specifications

Maximum permeation transmembrane pressure	83 kPa (12 psig)
Typical operating transmembrane pressure	7-70 kPa (1 to 10 psig)
Maximum backpulse transmembrane pressure	69 kPa (10 psig)
Maximum operating temperature	40°C (104 °F)



Water for the World

Tech.ZW500d48M.V2.4.0



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ZENON is a global leader in the development and manufacturing of membrane technologies and systems for water treatment, wastewater treatment and water reuse. With thousands of installations worldwide, ZENON is providing cost-effective and reliable solutions to challenges faced by municipalities, industry and government agencies.

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ZMOD 320516 Operations Sequence Chart

Legend		Discontinued Devices																Comments & Sequencing Logic
Step Description	Tag Numbers	AB-10/13/14	VAB	VAM	VAB	P-1031/32	VAM	VAB	VAB	MP-1021/22	P-1120	P-1110	UV-10/30	P-1080	UV Strainer UV-10/10	HypO Dosing Pump P1080	Step	
<p>The Operations Sequence Chart (OSC), Control Logic Chart (CLC) and the Control Narrative (CN) should all be read to assist in the understanding of system operations.</p>																		
<p>0 - Indicates that the valve/motor is closed/off in Auto.                      1 - Indicates that the valve/motor is open/on in Auto.                      LS - Indicates that the valve motor will rotate the last state it had (open/closed, on/off) to avoid damaging equipment.                      C- Indicates that the valve is alternating between open/close every 10 seconds                      M - Indicates that the valve/motor can be operated manually by the operator at the HMI.</p>																		
<p>Stops all rotating equipment, and leaves valves as they were.                      Waits for stop duration, and then proceeds to the next step.                      Train remains in this mode until the operator presses the ON button. After resetting (if the plant goes into off mode)                      If the ON button is pressed proceeds to STANDBY - Step 1                      If the Clean or Hypo R Clean button is pressed proceeds to - R.CLEAN - Step 1.                      If PRIME TRAIN pushbutton is pressed proceeds to PRIME - step 1.                      Sequence complete.</p>																		
<p>Stops all rotating equipment, and leaves valves as they were.                      Waits for stop duration, and then proceeds to the next step.                      Train remains in this mode until the operator presses the ON button. After resetting (if the plant goes into off mode)                      If the ON button is pressed proceeds to STANDBY - Step 1.                      If the Clean or Hypo R Clean button is pressed proceeds to - R.CLEAN - Step 1.                      If PRIME TRAIN pushbutton is pressed proceeds to PRIME - step 1.                      Sequence complete.</p>																		
<p>Necessary condition is 'Layer Above Membrane'                      Hold this step for 3 seconds then proceeds to next step.                      The train remains in this step indefinitely until one of the following occurs:                      If the M.CLEAN WITH TRAIN START) the train proceeds to PRIME - Step 1.                      If the M.CLEAN WITH TRAIN START) the train proceeds to BACKPULSE - Step 1.                      If the Relax button is pressed proceeds to RELAX - Step 1.                      Duration timer (TIMER SD/MEM AERRAS DURATION) and TIMER SF/MEM AERRAS FREQUENCY) to be contacted for Membrane blower and RAS pump. See Note below)</p>																		
<p>Holds this step for 12 seconds then proceeds to next step.                      If PRIME was initiated from OFF then proceeds to OFF - step 1.</p>																		
<p>Hold this step for 3 seconds then proceeds to next step.                      Starts P1031/32 and controls the flow rate at 'PERMEATE FLOW SP'. PID Loop to be considered and trend to be displayed on HMI                      If MAINTENANCE CLEAN request is active proceeds to MAINTENANCE CLEAN - step 1.                      When backpulse is not available (Eg. Tank level Low), the train goes to RELAX.</p>																		
<p>Hold this step for 12 seconds then proceeds to next step.                      Starts P1031/32 and controls the flow rate at BACKPULSE FLOW SP. PID Loop to be considered and trend to be displayed on HMI                      Hold this step for timer BACKPULSE TIMER)                      Waits for stop duration, then proceeds to next step.                      If START TRAIN - step 1, then proceeds to STANDBY - step 1.                      Otherwise proceeds to STANDBY - step 1.                      If the BACKPULSE was initiated from OFF, proceeds to OFF - step 1.                      If the BACKPULSE was initiated from STANDBY, proceeds to STANDBY - step 1.</p>																		

**Control Philosophy for VFD based drives**

Following VFD drives will be operated based on respective process parameters / manually as:-

- A) Membrane tank blowers (AB - 1031 / 32/ 33) will be operated with manual intervention through VFD controlled operation manually. Two blowers will be operated for both phases keeping 3rd blower stand by. Same will be Comes into service based on the signal / input received from flow switch installed at the piping discharge for respective phase. At respective low flow switch input at the discharge of AB - 1031 / 32 OR AB - 1032 / 33, stand by blower will come into service provided blower is selected in REMOTE mode. A delay of 6 sec will be there for flow switch consideration. After 6 sec if the will remain low, stand by pump will start and existing will stop.
- B) Membrane bioreactor blowers (AB - 1021/22/23) will be operated based on respective dissolved oxygen meter (DOA - 501/502) through auto VFD controlled operation. Set point will be 3 PPM. Out of 3 blowers, two will be working for both phases and 3rd one will be stand by always. DO set point will be settable from HMI.
- C) Membrane backwash pumps (P - 1041/42 OR P - 1043/44) will be operated based on respective flow transmitter (FT -103/104) through auto VFD controlled operation. Set point will be 56 M3/Hr. One pump will be working and other one will be stand by always. FT set point will be settable from HMI.
- D) Flushing water transfer pumps (P - 1061/62/63) will be operated based on respective flow transmitter at the discharge line through auto VFD controlled operation. Set point will be 36 M3/Hr. Two pumps will be working and other one will be stand by always. FT set point will be settable from HMI.
- E) Flushing water transfer pumps (P - 1051/52/53) will be operated based on respective flow transmitter at the discharge line through auto VFD controlled operation. Set point will be 20 M3/Hr. Two pumps will be working and other one will be stand by always. FT set point will be settable from HMI.
- F) EQT / SHT blowers (AB - 1011/12) will be operated with manual intervention through VFD controlled operation manually.

**Note: -**

- 1. All analog parameters will be displayed and recoded at HMI.
- 2. Auto and semi auto operation provision has to be given for all drives / valves including single phase dosing pumps at HMI.
- 3. All drives will be tripped at respective tanks low level.

ZMOD 320516 Operations Sequence Chart

Step #	Step Description	Tag Numbers	Dedicated Drivers													Duration (If hold, minutes unless noted)	Step										
			Membrane Power AB101314	Membrane Ejector Assembly Valve No 1	Membrane Ejector Assembly Valve No 2	Permeate Discharge Valve V43	Permeate Discharge Valve V43	Permeate Discharge Valve V43	Pumps Pump (P101102)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)			Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	Backwash Valve (V43)	
<p><b>OPERATING STATE</b></p> <p><b>Legend</b></p> <ul style="list-style-type: none"> <li>0 - Indicates that the valve/motor is closed/off in Auto.</li> <li>1 - Indicates that the valve/motor is open in Auto.</li> <li>LB - Indicates that the valve/motor will retain the last state it had (open/closed, on/off) to avoid damaging equipment.</li> <li>C - Indicates that the valve is alternating between open/closed every 10 seconds</li> <li>M - Indicates that the valve/motor can be operated manually by the operator at the HMI.</li> </ul> <p>The Operations Sequence Chart (OSC), Control Logic Chart (CLC) and the Control Narrative (CN) should all be read to assist in the understanding of system operations.</p> <p>Comments &amp; Sequencing Logic</p>																											

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Severity	Log	Function	Notes				
<b>Plant Information</b>																					
	Control Documents		Info								The OGC, PLC and Control Narrative with the PID's should be viewed in their entirety to assist in the understanding of plant control.										
	Returning a Train to ON		Info								Any alarm i.e. an alarm, which causes a train to shutdown will require the operator to put the train back to ON from OFF.										
	Returning a Devices to Auto		Info								Any devices which is placed into Manual Stop, i.e. due to an alarm will need to be placed back into Auto by the operator.										
	Setpoints		Info								All setpoints to be verified in the field. Changes may be required for field conditions & requirements.										
	Device Display Colors, Line Display Colors & Status (HMI & SCADA)		Info	Colors							The following color scheme is used for device status: GREEN - indicates a pump is on and a valve is open. RED - indicates a pump is off and a valve is closed. WHITE - indicates a valve is travelling. YELLOW - indicates a pump or valve has failed. Green and red color selections are logged when Device Display Color Green for Running (0-HS-001) is selected to RED. A device in Lock will have a 'L' symbol displayed over or beside the device. A device placed in MANUAL control will have MAN displayed over or beside the device.										
	Display Instrumentation Values (HMI & SCADA)		Info	Plant							The Following items are to be displayed 1) All analog instrumentation signals wired directly to the GE PLC 2) All analog instrumentation signals wired to the GE PLC by another PLC 3) TMP										
	Trending PID Loops		Info	Plant							All PID loop parameters are trended										
	Motor & Air Compressor 'Auto Start/Stop' Control		Info	Plant							Each motor and Air Compressor has a pop-up screen displaying Auto Stop and Start buttons. Pressing Auto-Places the devices into Auto Mode Start- Places the devices into Manual start Stop- Places the devices into Manual stop										
	Motor & Air Compressor Runtime Info		Info	Plant							Each motor and Air Compressor has a pop-up screen displaying Accumulated Runtime (Hours) and Runtime Reset buttons. Reset- Resets the accumulated runtime to Zero.										
	Valve 'Auto/Open/Close' Control		Info	Plant							Each automatic Valve has a pop-up screen displaying Auto, Open and Close buttons. Auto- Places the device in Auto Mode Open- Places the device into Manual Open Close- Places the device into Manual Close.										
	HMI Security Level = Administrator		Info	Security							The Administrator user type shall have the Supervisor privileges and also the following privileges: - Security configuration, including adding users and changing passwords - All SCADA/HMI application and operating system privileges When the user name and password are entered, after one hour of inactivity and/or four hours after logging in, the user will be required by selection of the Logout button on the HMI to: - Resets to Guest level.										
	Model Errors		Info								User name and password entry accessible from any process graphic, by selection of Login button displayed on user name entry graphic. Includes Logout button, common to all security levels, accessible from all graphics.										

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set/Derivation	Reset	Action	Operator Interface	Alarm Type	Severity	Log	Revision	Notes	
RESET	Alarm Reset HMI Security Level - Supervisor	00-00-00	Info	Button Security					When the user name and password are entered. Default user name: SUPER Default password: per design guide on the Co-07003	Alter one hour of inactivity and/or four hours after logging in. Also reset by selection of the Logout button on the Co-07003 Resets to Guest level.	Clear all the active alarms. The Supervisor user type shall have the Operator privileges and also the following privileges: - Adjust all presets and setpoints - Place devices such as pumps and valves in Manual (in addition to Auto) - Adjust PID tuning parameters	when the button is pressed User name and password entry accessible from any process graphic, by selection of Login button. Current user displayed on HMI screen graphic. Includes Logout button, accessible from all graphics.						
	HMI Security Level - Operator	00-00-00	Info	Security					When the user name and password are entered. Default user name: OPER Default password: per design guide on the Co-07003	Alter one hour of inactivity and/or four hours after logging in. Also reset by selection of the Logout button on the Co-07003 Resets to Guest level.	The Operator user type shall have the Guest privileges and also the following privileges: - Monitor presets and setpoints, and adjust process control setpoints (not process alarm setpoints) - Access process unit control buttons and reset alarms - Place devices such as pumps and valves in Auto (but not Manual) - Access PID controller popup screens, change PID control selections, and adjust PID control parameters (except PID tuning parameters)	User name and password entry accessible from any process graphic, by selection of Login button. Current user displayed on HMI screen graphic. Includes Logout button, common to all security levels, accessible from all graphics.						
	HMI Security Level - Guest	00-00-00	Info	Security					When no user is logged in.	None.	The Guest user type shall have the following privileges: - Navigate through the graphic screens and monitor plant and equipment status	User name and password entry accessible from any process graphic, by selection of Login button. Current user displayed on HMI screen graphic. Includes Logout button, common to all security levels, accessible from all graphics.						
	HMI Screen Saver	00-00-00	Info						After 30 minutes of inactivity, HMI system lock.	On any touch or any mouse action.	Activates screen saver.	Marquee banner "OE Water & Process Technologies" Displayed on all process graphics. Date = dd Mmm YYYY Time = 23:59:59						
	HMI Date and Time	00-K-001	Computed						PLC system clock.			Displayed on any graphic with a schedule setpoint. Includes Time Synchronize button for operator selection, accessible from all graphics. Includes PLC Time, Date = dd Mmm YYYY Time = 23:59:59						
	FLC Date and Time	00-K-001	Computed						Set to value of HMI Date and Time when the Time Synchronize button is pressed.									
00-HS-001	Device Display Color Green for Running	00-H-001	Switch						When the Color Green button is pressed. Set, and not available for operator selection, on FX SCADA design.	When the Color Red button is pressed.	Available selections: GREEN, RED. Used to select the desired color to be used when a pump is running or a valve is open.	Displayed on system configuration graphic Includes Color Green and Color Red buttons for operator selection, accessible from any process graphic. Buttons only available to the ADMINISTRATOR level of security access.						
00-YA-002	FLC I/O Fault	00-Y-002	Alarm						ALWAYS: - when fault status is selected from any I/O module	Manual Reset. When Alarm Reset distribution is pressed	If any Train is in any step of Production, Backgauge/Relax, or CIP: - stops all pumps and closes all valves associated with the step. - inhibits any automatic transition to next step.	Alarm message: Sin C Y						
00-YA-004	Alarm Horn	00-Y-004	Switch						When any new alarm is detected.	When the Horn Mute button is pressed.	Engagez PLC discrete output to activate alarm horn.	Animates color of Horn Mute button to red. Includes Horn Mute button for operator selection, accessible from all graphics.						

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Severity	Log	Remarks	Notes
<b>FEED SYSTEM</b>																	
08-P-100A/B	Grunder pump control	08-P-100A/B	Alarm	pumps	-	-	-	-	When the Grunder pump 08-P-4100-A is requested to run and the running signal is not received for 5 seconds	When the reset button is pressed. The operator has to put the equipment back into Auto.	Put the Pump in Manual Stop. Switch the Lag Pump to Lead Blower.	Display of message and the status in control graphic.	A	N	Y		
08-KY-100A/B	Grunder Pump Duty Cycle		Setpoint					Hour			Switch the Lag blower to Lead blower	Display of runtime in the Graphic screen					
<b>BIOREACTOR SYSTEM</b>																	
15-B-400-A/B	Process Blower Lead/Lag control		Alarm	Blower	-	-	-	-	When the process blower 15-B-400-A is requested to run and the running signal is not received for 5 seconds	When the reset button is pressed. The operator has to put the equipment back into Auto.	Put the blower in Manual Stop. Switch the Lag blower to Lead blower.	Display of message and the status in control graphic.	A	N	Y		
15-YA-401-A	Process Blower-1 Fail to Start	15-B-400-X	Alarm						When the process blower 15-B-400-B is requested to run and the running signal is not received for 5 seconds	When the reset button is pressed. The operator has to put the equipment back into Auto.	Put the blower in Manual Stop. Switch the Lag blower to Lead blower.	Display of message and the status in control graphic.	A	N	Y		
15-YA-401-B	Process Blower-2 Fail to Start	15-B-400-X	Alarm						When the process blower 15-B-400-B is requested to run and the running signal is not received for 5 seconds	When the reset button is pressed. The operator has to put the equipment back into Auto.	Put the blower in Manual Stop. Switch the Lag blower to Lead blower.	Display of message and the status in control graphic.	A	N	Y		
15-YA1-400	No Process Blower Available	15-B-400-X	Alarm						IN ALL MODES: -all steps, when there is no blower available to run in auto. Air flow switch located on the blower. When the blower has been running for 10 seconds and the low flow signal is received for 5 seconds.	When any Blower is back in Auto Mode When the reset button is pressed. The operator has to put the equipment back into Auto.	Callout. Shut down the train by putting it to OFF- Step 1. Put the blower in Manual Stop. Switch the Lag blower to Lead blower.	Display of message and the status in control graphic.	Sn	C	Y		
15-FAL-400	Process Blower air flow low	15-FSL-400	Alarm						When the blower has been running for 10 seconds and the low flow signal is received for 5 seconds.	When the reset button is pressed. The operator has to put the equipment back into Auto.	Switch the Lag blower to Lead blower.	Display of message and the status in control graphic.	Sn	N	Y		
15-KY-400	Process Blower Duty Cycle		Setpoint					Hour			Switch the Lag blower to Lead blower	Display of runtime in the Graphic screen	A	N	Y		
15-YA-401	Anoxic Process Mixer fails to Start	15-M-401	Alarm	Mixer			12		When the Mixer is requested to run and the running signal is not received for 5 seconds	When the Mixer is running	Put the Mixer in Manual stop. Alarm	display of status and the total run hours.	A	N	Y		
15-M-401	Anoxic Process Mixer		Motor	Mixer	FIELD SET	FIELD SET	FIELD SET	mm	When the level is above 15-LYH-401 for 5 seconds	When the level is above 15-LCL-401-X - all steps, proceeds to STANDBY - step 1.	When the Mixer is in Auto it runs IN PRODUCTION, RELAX & BACKPULSE - all steps, proceeds to STANDBY - step 1.	display of status and the total run hours.	A	N	Y		
15-LALL-401	Bioreactor Tank Level Low Low	15-LUT-401	Alarm	Level	FIELD SET	FIELD SET	FIELD SET	mm	When the level is at or above the setpoint for 5 seconds	When the level is at or above the setpoint for 10 seconds	IN MAINTENANCE CLEAN, RECOVERY CLEAN & NEUTRALIZATION: - all steps, complete mode. Prevents trans from entering PRODUCTION, BACKPULSE & RELAX modes. Display the value in Engineering Units	display of status and the total run hours.	A	N	Y		
15-LUT-401	Bioreactor Tank level		Analog In	Level	FIELD SET	FIELD SET	FIELD SET	mm	When the level is at or above 15-LYH-401 for 5 seconds	When the level is at or above the setpoint for 5 seconds	Display the value in Engineering Units	display of status and the total run hours.	A	N	Y		
15-LYH-401	Bioreactor tank Level High Trigger	15-LUT-401	Sequence	Level	FIELD SET	FIELD SET	FIELD SET	mm	When the level is at or above the setpoint for 5 seconds	When the level is at or above the setpoint for 5 seconds	Display the value in Engineering Units	display of status and the total run hours.	A	N	Y		
15-LAHH-401	Bioreactor tank Level High	15-LUT-401	Alarm	Level	FIELD SET	FIELD SET	FIELD SET	mm	When the level is at or above the setpoint for 5 seconds	When the level is at or above the setpoint for 5 seconds	Display the value in Engineering Units	display of status and the total run hours.	A	N	Y		
20-FC-7500	Plant flow demand										The plant flow demand is calculated using below eq. It is the proportional control based on changing levels. The trim should be proportional control based on an average membrane tank FC-7500 = 20-FC2-7500	Alarm Message	A	N	Y		

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min.	Range Max.	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Severity	Log	Revision	Notes
<b>ZEEWEED PROCESS SYSTEM</b>																	
	Mode Selection through OFF		Sequencer	Control							When the OFF button is pressed, proceeds to FAULT- step 1. Refer the OSC for detail regarding switching from one mode to another from OFF.	Displayed on process graphic and unit control graphic. In OFF mode, the OFF mode buttons for operator selection, accessible from unit control graphic.					
	Mode Selection through ON		Selector	Control							IN OFF: While the train is in OFF - Step 2, if the On button is pressed, the train proceeds to STANDBY - Step 1 and will cycle through the other modes as already set up and provided all necessary equipment is in Auto and available for use.	Displayed on process graphic and unit control graphic.					
	Operation Mode Indicator		Info	Control								Displays the Train's current Operating Mode on the HMI. Time remaining in particular mode is not always displayed					
ON-PB-X	ON Button		Selector	Control					When Button is pressed		In OFF: Proceeds to STANDBY - Step 1.						
OFF-PB-X	OFF Button		Selector	Control					When Button is pressed		Allows the operator to indicate that actions have been completed as required in response to the screen prompts.						
ADV-PB-X	Advance Button		Selector	Control					When Button is pressed		In STANDBY & PRODUCTION BACKPULSE Mode selected - Proceeds to BACKPULSE-STEP 1.						
BP-PB-X	Backpulse or Relax Button		Selector	Control					When Button is pressed		RELAX Mode selected - Proceeds to Relax - step 1.						
20-KV-3000	Production Duration		Setpoint	Timer	5	20	12	minutes			The duration of Production Step						
20-KV-3002	Priming Duration		Setpoint	Timer	300	60	30	Seconds		When the timer times out.	In Prime: Initiates action when the timer times out proceeds as per OSC.						
20-O-3000	No. of Trains in Production Cycle		Info	Demand	0	1	1	step			Number of trains in production cycle (Prime, production, relax, and backpulse).						
20-HIS13-3000-X	M CLEAN WITH CITRIC ACID BUTTON		Selector	Control					When Button is pressed		IN OFF, STANDBY & PRODUCTION: - steps as per OSC, proceeds to MAINTENANCE CLEAN - step 1.						
20-HIS14-3000-X	M CLEAN WITH SODIUM HYPOCHLORITE BUTTON		Selector	Control					When Button is pressed		Consult interlocks in CLSC and OSC for more information. Initiates a full tank maintenance clean with citric acid.						
20-HIS15-3000-X	R CLEAN WITH CITRIC ACID BUTTON		Selector	Control					When Button is pressed		IN OFF, STANDBY & PRODUCTION: - steps as per OSC, proceeds to MAINTENANCE CLEAN - step 1.						
20-HIS16-3000-X	R CLEAN WITH SODIUM HYPOCHLORITE BUTTON		Selector	Control					When Button is pressed		Consult interlocks in CLSC and OSC for more information. Initiates a full tank maintenance clean with citric acid.						

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Severity	Log	Position	Notes			
<b>Membrane Aeration System</b>																				
20-B-200	Membrane Blower Control		Info	Blower																
20-YA-200	Membrane Blower Fail to Start	20-B-200	Alarm						When the Blower is requested to run and run feedback is not received for 3 seconds	When the reset button is pressed and the operator needs to put back into Auto Mode.	Put the Blower in Manual stop.	Alarm message display	A	C	Y					
20-YA1-200	No Membrane Blower Available	20-B-200	Alarm						Callout	When the Blower is back in auto mode	Shutdown trains in the following order until there are sufficient blowers IN STANDBY: -all steps, continue without blower. Auto-close the train's aeration valve 20-FV-200-X -delay six seconds and if there is still insufficient number of blowers IN MAINTENANCE CLEAN, RECOVERY CLEAN: -all steps, continues steps without blower. Auto-close the train's aeration valve 20-FV-200-X -delay six seconds and if there is still insufficient number of blowers IN PRODUCTION, RELAX, & BACKPULSE: -one train goes to OFF step 1. -delay six seconds and if there is still insufficient number of blowers, shutdown the other train.									
20-FAL-200	Membrane Blower Air Flow Low	20-FSL-200	Alarm						The Air flow switch is located on the common header. IN ALL MODES: -all steps, when the Blower is requested to run and switch 20-FSL-200 is active for 10 seconds.	When the reset button is pressed, and the operator needs to put Back into Auto Mode.	Put the Blower in Manual stop.	Alarm message display	Sn	C	Y					
20-KY1-200-X	Membrane Tank Cyclic Valve Cycle Time	20-FV-200-AB	Setpoint		10	10	Seconds				Valves 20-FV-200-A and 20-FV-200-B will alternate between open and close positions every 10 seconds. One valve will be open and another will be closed.									
20-KY4-200	Train in Standby Aeration Frequency	20-FV-200-AB	Sequencer		10	10	minutes		IN STANDBY: Step-3	When a train is not in Standby - step 3.	IN STANDBY: -step 2, aerates the membrane tank for 20-KY3-200 seconds every 20-KY4-200 seconds. Starts step with no mixing.									
20-KY3-200	Train in Standby Aeration Duration	20-CV-201-AB,2-3	Sequencer		0.5	10	minutes		IN STANDBY: Step-3	When a train is not in Standby - step 3.	IN STANDBY: -step 2, aerates the membrane tank for 20-KY3-200 seconds every 20-KY4-201 seconds. Starts step with no mixing.									
20-ZAC-200-A,2	Cyclic Valve Failed to Open	20-FV-200-AB	Alarm						IN ALL MODES: When Open Limit switch is not activated for 60 sec when the valve is asked to open	When the reset button is pressed	Callout Relax -all steps, Proceed to OFF - step 1. IN MAINTENANCE CLEAN & RECOVERY CLEAN: -all steps, continues Maintenance Clean or Recovery Clean without aeration. Once steps are complete, proceeds to OFF - step 1. IN PRODUCTION, Backpulse & BACKPULSE: -all steps, Proceed to OFF - step 1. IN MAINTENANCE CLEAN & RECOVERY CLEAN: -all steps, continues Maintenance Clean or Recovery Clean without aeration. Once steps are complete, proceeds to OFF - step 1.	Alarm Message	Sn	C	Y					
20-ZAC-200-A, 20-ZAC-200-B	Cyclic Valve Failed to Close	20-FV-200-AB	Alarm						IN ALL MODES: When Close Limit switch is not activated for 60 sec when the valve is asked to close	When Close Limit Switch is activated	Callout IN PRODUCTION, BACKPULSE & RELAX: -all steps, continues to cycle valve. Train is placed into demand override. IN MAINTENANCE CLEAN: -all steps, proceeds to STANDBY - step 1. IN RECOVERY CLEAN: -all steps, proceeds to FAULT - step 1. Displays on alarm banner "Recovery Clean Aborted". Maintenance Cleans, Recovery Cleans and Backwashes are prevented on trains which are in demand override.	Displays on alarm banner "Train has a Cyclic Valve Failure, inadequate aeration may be Occurring" IN MAINTENANCE CLEAN; Displays on alarm banner "Maintenance Clean Aborted" IN RECOVERY CLEAN; Displays on alarm banner "RECOVERY Clean Aborted"	A	C	Y					



ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Priority	Log	Position	Notes	
<b>Membrane Tank System</b>																		
20-LIT-200	Membrane Tank Level		Alarm	Level	0	TBD		mm	Displays the Membrane level		Display the value in Engineering Units	Displayed the value and the Setpoint section in a popup screen						
20-LX1-200	Average Membrane Tank Level		Derived	Level					When the IO Module detects the transmitter out of range		The average level of all membrane tanks when the trains are in STANDBY, PRODUCTION, RELAX, BACKPULSE, IN STANDBY, PRIME, BACKPULSE, RELAX, PRODUCTION, MAINTENANCE CLEAN, RECOVERY CLEAN. - all steps. proceeds to OFF - step 1.	Alarm message.						
20-LA-200	Tank Level Transmitter Out of Range		Alarm								IN MAINTENANCE CLEAN: - Displays on alarm banner "Maintenance Clean Aborted." IN RECOVERY CLEAN: - Displays on alarm banner "Recovery Clean Aborted."							
20-LALL-200	Membrane Tank Level Low	20-LIT-200	Alarm				TBD	mm	Callout	When the level is above the setpoint	IN PRODUCTION: Put the Train to Standby-step-1	Alarm Message: Membrane Tank Level Low Display	A					
20-LAH-200	Membrane Tank Level High	20-LIT-200	Alarm				TBD	mm	IN PRODUCTION: When the level is at or above this setpoint for 10 seconds for either or any any membrane tank.	Manual Reset: When the Alarm Reset pushbutton is pressed. And the level is below the setpoint	IN PRODUCTION: CALLOUT. Close the valve 20-FCV-201	Alarm message.	A					
20-LY1-200	Membrane Tank Level to Enable Membrane Tank Feed	20-LIT-200	Sequencer				TBD	mm	IN ALL MODES: When the level is at or below this level for 8 seconds	Monetary.	Resets 20-LAH-200							
20-LY2-200	Membrane Tank Level 3 for Fill	20-LIT-200	Sequencer				TBD	mm	IN RECOVERY CLEAN: Step 20 When the level is at or below this level for 8 seconds	When the level switch is not active	IN RECOVERY CLEAN: - proceeds to the next step. Target setpoint is a level about 300 mm above the 20-LY2-200 setpoint but prevents the membrane tank from overflowing.							
20-LY2-200	Membrane Tank Level above Membranes	20-LIT-200	Sequencer				TBD	mm	IN ALL MODES: When the level is at or above this level for 8 seconds.		Resets 20-LAL-200. IN STANDBY: The train will come out of standby and resume production if there is no flow in the water. IN RECOVERY CLEAN: - proceed according to the OSC.							
20-LAL-200	Membrane Tank Level Low	20-LIT-200	Sequencer				TBD	mm	When the Membrane Tank Level is at or below this setpoint for 10 seconds.	When the level is at or above 20-LY2-200.	Callout. IN PRODUCTION: Put train to STANDBY - Step 1.	display of alarm message						
20-LALL-200	Membrane Tank Level Low Low	20-LIT-200	Alarm				20-LAL-200	mm	When the Membrane Tank Level is at or below this setpoint for 3000 seconds.	When the level is at or above 20-LY2-200.	IN ALL MODES: - all steps. displays on alarm banner "Membrane Tank X" Possible Membrane Exposure.	display of alarm message	A					
20-LALL-201-2x	Membrane Tank Level Low Low Possible Exposure	20-LSL-201-2 X	Alarm						IN ALL MODES: When the level Alarm low low 20-LALL-201-2x has been active for more than 3000 seconds.	When the 20-LSL-201-2x is no longer active	IN ALL MODES: - all steps. displays on alarm banner "Membrane Tank X" Possible Membrane Exposure.	display of alarm message	A					
20-LY2-200	Membrane Tank Empty Tank	20-LIT-200	Sequencer				0	mm	IN RECOVERY CLEAN: When the level is below the setpoint for 2 seconds in the steps as indicated in the OSC.		IN RECOVERY CLEAN: - steps as indicated in the OSC, proceeds to next step. Level Inger sat at the lowest possible level without losing prime on the HAS pump 16-P-402 X.							

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Bus Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Priority	Log	Version	Notes	
20-FC2-7320	Membrane Tank Level Proportional Controller	20-LIT-200	Controller	proportional					Plant Trim Flow Demand = proportional to average membrane tank level, as shown below. 20-FC2-7320 = (Max. Permeate Flow x (20-LCH-200 - 20-LCL-200) / (20-LCH-200 - 20-LCL-200)) Where: Maximum control level is 20-LCH-200 where permeate demand must equal the maximum peak flow for the entire plant. Minimum control level is 20-LCL-200 where trim flow demand is 0 m3/min. This is the plant permeate trim flow used to calculate the net permeate flow for the entire PLANT PRODUCTION, 20-FC301-X.			Setpoint adjustment on popup accessible from process graphic indication of level.						
20-LC-200	Membrane tank Level Setpoint	20-LIT-200	Setpoint				TBD	mm			This is used as SP for the 20-LC-200 PID	Setpoint adjustment on popup accessible from process graphic indication of level.						
<b>Permeate System</b>																		
20-FCH-301	Instantaneous Permeate Flow	20-FIT-301	Info	Flow			TBD	M3/HR										
20-FCL-301	Instantaneous Permeate Flow	20-FIT-301	Info	Flow			#	M3/HR			This is the Upper limit for 20-FC-301							
20-FYH-7320	0 TRAIN TO 1 TRAIN TRIGGER		Setpoint	Demand	FIELD SET	FIELD SET	FIELD SET	M3/HR	20-FC-7320 IS AT OR ABOVE THIS SETPOINT		This is the Lower limit for 20-FC-301							
20-FYL-7320	1 TRAIN TO 0 TRAIN TRIGGER		Setpoint	Demand	FIELD SET	FIELD SET	FIELD SET	M3/HR	20-FC-7320 IS AT OR BELOW THIS SETPOINT		Places 1 train into production step-1							
20-FAH-301	Permeate Flow High High	20-FIT-301	Alarm		FIELD SET	FIELD SET	FIELD SET	M3/HR	IN PRODUCTION: When the permeate flow has been above this setpoint for 10 seconds.	When the reset button is pressed	Callout	Display of alarm message	Sn C	Y				
20-FAL-301	Permeate Flow Low Low	20-FIT-301	Alarm		FIELD SET	FIELD SET	FIELD SET	M3/HR	IN PRODUCTION: When the Permeate Pump has been running for 5 seconds and the permeate flow has been at or below this setpoint for 20 seconds.	When the reset button is pressed	Callout	Display of alarm message	Sn C	Y				
20-FIT-301	Permeate Backpulse Flow		Analog In		0.00	60.00		M3/HR	Displays the value in engineering units			Display of Actual Value and field adjustment setpoint.	Sn C	Y				
20-FA-301	Permeate Backpulse Flow Out of range	20-FIT-301	Alarm						IN ALL MODES: When the transmitter is out of range by 1% of the calibrated range for 2 seconds. (i.e. calibrated range = range max. - range min.)	When the Transmitter in range	IN PRODUCTION, BACKPULSE MAINTENANCE CLEAN, RECOVERY CLEAN. - all steps, proceeds to OFF - step 1.	Alarm Message	Sn C	Y				
20-FIT-300	Membrane Header Pressure		Analog In		-10.00	15.00		kg/cm2	Displays the value in engineering units									
20-PAH-300	Process Pump Pressure High	20-FIT-300	Alarm						IN BACKPULSE MAINTENANCE CLEAN, RECOVERY CLEAN: - all steps, when the backpulse header pressure is at or above this setpoint for 6 seconds.	When the reset button is pressed. The operator has to put the equipment back into Auto.	IN BACKPULSE MAINTENANCE CLEAN, RECOVERY CLEAN: - all steps, proceeds to SHUTDOWN - step 1.	Display of Actual Value and field adjustment setpoint.	Sn C	Y				
20-PA-300	Permeate Backpulse Pressure Transmitter Out of range	20-FIT-300	Alarm						IN ALL MODES: When the transmitter is out of range by 1% of the calibrated range for 2 seconds. (i.e. calibrated range = range max. - range min.)	When the Transmitter in range	IN PRODUCTION, BACKPULSE MAINTENANCE CLEAN, RECOVERY CLEAN: - all steps, proceeds to OFF - step 1.	Alarm Message	Sn C	Y				

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Bus Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Severity	Log	Position	Notes	
20-HA-300	Permeate Backpulsing Pump Fail to start	20-P-300	Alarm						IN ALL MODES: -all steps, when the MCC is no longer in Auto.	When the MCC is returned to Auto.	Pump control is removed from the PLC and the pump is placed in the MCC control.  When reset, the pump control is returned to the PLC.		Sn	C	Y			
20-YA-300	Permeate Backpulsing Pump Fail to start	20-P-300	Alarm						When the Pump is requested to run and the VFD signal is not received for 2 seconds.	When the reset button is pressed. The operator has to put the equipment back into Auto.	Calcut.  IN PRODUCTION, BACKPULSE, RELAX, STANDBY & M-CLEAN: Shutdown the train by pulling it to OFF - Step 1.  IN R-CLEAN: Abort R-CLEAN. Put the permeate-backpulsing pump in Manual Stop. Put the train into OFF - Step 1.	Displayed of Alarm Message	Sn	C	Y			
20-SC-300	Permeate Backpulsing Pump Speed	20-P-300	Setpoint		25	100		%	When the VFD Signal is Received for 2 seconds.	When the reset button is pressed. The operator has to put the equipment back into Auto.	WHEN IN MANUAL-START MODE: Pump speed is entered at HMI.  IN AUTO MODE: -all steps, this setpoint is overwritten by the CV value from PID loop low controller 20-FIC-301-x to control the pump. IN R-CLEAN: MAINTENANCE CLEAN & RECOVERY CLEAN: -all steps, this setpoint is overwritten by the CV value from PID loop low controller 20-FIC-8820-x to control the pump. Calcut.		Sn	C	Y			
20-JA-300	Permeate Backpulsing Pump VFD Fault	20-P-300	Alarm						When the VFD Signal is Received for 2 seconds.	When the reset button is pressed. The operator has to put the equipment back into Auto.	IN PRODUCTION, BACKPULSE, RELAX, STANDBY & M-CLEAN: Shutdown the train by pulling it to OFF - Step 1.  IN R-CLEAN: Abort R-CLEAN. Put the permeate-backpulsing pump in Manual Stop. Put the train into OFF - Step 1.	Displayed of Alarm Message	Sn	C	Y			
20-FCALL-300	TMP Low Low	20-PIT-300	Alarm		-0.562	0	-0.562		IN PRODUCTION: When the TMP has been at or below this setpoint for 8 seconds.	When the reset button is pressed.	Train proceeds to OFF - Step 1.		Sn	C	Y			
20-PDYLL-300	TMP Low Low Display	20-PIT-300	Computed		0	-0.682	-0.682		IN ALL MODES: -all steps, when the TMP is above the setpoint, then increases the maximum value for 20-FIC-301-x CV by 0.25% every second until it reaches 100%.  IN PRODUCTION: -all steps, when the TMP is at or below this setpoint.	When the reset button is pressed.	IN PRODUCTION: -all steps, ensures the initial value for the maximum of the 20-FIC-301-x CV as: initial value for the maximum CV = (CV value of 20-FIC-301-x) - 0.25 Then reduces the maximum value for 20-FIC-301-x CV by 0.25% every second until it reaches to the minimum of 25%.				Y			
20-FCULL-300	TMP Trigger for Extra Air Removal	20-PIT-300	Computed						IN PRODUCTION: -all steps, when maximum value for 20-FIC-301-x CV is below 100%.	-all steps, when the TMP is above the setpoint, then increases the maximum value for 20-FIC-301-x CV by 0.25% every second until it reaches 100%.	Displays "TMP at limit" indication on the screen.				Y			

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Severity	Log	Revision	Notes	
20-FD3-300	Transmembrane pressure TMP	20-PTT-300	Computed						TMP = Membrane Header Pressure + Conversion Factor x (Height of the Pressure Transmitter Above the Top of the Membranes + Height from the Bottom of the Tank to the Pressure Transmitter Fibers + Membrane Tank Level) Control Control Narrative for Further Details PRODUCTION & BACKPULSE: 20-PD3-300 = 20-PT-300 + C x [(A + B - (20-U-200) ) ] A = Top of Membranes to Pressure Transmitter B = Bottom of Tank to top of the Membrane Fibers C = 0.0001 bar/min. The calculation is used for all time.		Display the computed value. Also A adjustable high limit, low limit and the setpoint.							
20-FC-301	Permeate Flow Setpoint	20-FTT-301	Setpoint	Flow	20-FCL-301	20-FCH-301	CALCULATED	L/M			20-FC-301-X = 20-FC-700/20-O-3000-X							
20-FI-301	Permeate Flow PID Controller	20-FTT-301	Controller	PID			Non-FIELD SET Update-1 sec				PV is the flowmeter, 20-FTT-301 SP is 20-FC-301 in PRODUCTION CV is the permeate backpulse pump 20-P-300 output % The Minimum CV is 25% and the maximum CV is defined by 20- P0YLL-300 Action IN E-SPP-PV							
20-FIC-820-X	Backpulse CIP Flow PID Controller	20-FTT-301	Controller	PID			Non-FIELD D SET Update-1 sec				PV is the flowmeter, 20-FTT-301 SP is 20-FC1-301 in BACKPULSE SP is 20-FC2-301 in MC CIP SP is 20-FC3-301 in RC CIP CV is the permeate backpulse pump 20-P-300 output % The Minimum CV is 25% and the maximum CV is defined by 20- P0YH-600 Action E-SPP-PV							
20-AAH-300	Permeate Turbidity High	20-AIT-300	Alarm		0	5	1	ntu	In Production: -when the Turbidity has been at or above this setpoint for 30 seconds.	When the turbidity is below the setpoint	Alarm only Display of alarm message	A	N					
20-AAH-300	Permeate Turbidity High High	20-AIT-300	Alarm		0	5	1	ntu	In Production: -when the Turbidity has been at or above this setpoint for 60 seconds.	When the reset button is pressed	Callout. IN PRODUCTION: Train proceeds to OFF - Stop 1. Displays value with engineering units on screen	A	N					
20-AIT-300	Permeate Turbidity		Analog In		0	10		ntu			Actual instrument is 20-AE-AIT-300 Calculates the Train's Production Volume for Today = Permeate volume during PRODUCTION minus Backpulse volume from BACKPULSE displays value on the screen.							
20-FD1-3222	Today's Permeate Volume		Computed				2	KLD	At midnight after current value is put into 20-FD1- 3222-X		At midnight the value is stored at 20-FD1-3222 20-FD1-3222 - 20-FI-301 (in PRODUCTION) -20-FI-301 (during BACKPULSE)							
20-FD2-3222-x	Yesterday's Permeate Volume		Computed				2	KLD	At midnight	Reset at 1x10 <sup>9</sup>	Sets current value to 20-FD1-3222-X Value is displayed on the screen until the next midnight. Totalize the net permeate flow during the production cycle.							
20-FD3-3222-x	Accumulated Cycle's Permeate Volume		Computed															

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Priority	Log	Version	Notes	
<b>Recirculation System</b>																		
16-P-402-X	RAS Pump control		Motor															
16-HA-402-X	RAS Pump fail to Start	16-P-402-X	Alarm						IN ALL MODES: -all steps, when the MCC is no longer in Auto. IN ALL MODES: -all steps, when there are no recirculation pumps available to run in auto or manual start.	When the MCC is returned to Auto. When any recirculation pump is placed into auto or manual start. IN MAINTENANCE CLEAN & RECOVERY CLEAN: -all steps, proceeds to FAULT - step 1.	There are two pumps, one working and one standby. The standby pump is used if the working pump fails. Pump control is removed from the PLC and the pump is placed in the MCC control.		A	N	Y			
16-YAI-402	No Recirculation Pump Available	16-P-402	Alarm						IN ALL MODES: -all steps, when the MCC is no longer in Auto. IN ALL MODES: -all steps, when there are no recirculation pumps available to run in auto or manual start.	When any recirculation pump is placed into auto or manual start. IN MAINTENANCE CLEAN & RECOVERY CLEAN: -all steps, proceeds to FAULT - step 1.	When reset, the pump control is returned to the PLC. Callout IN STANDBY, PRODUCTION BACKPULSE & RELAX: -all steps, proceeds to FAULT - step 1. IN MAINTENANCE CLEAN & RECOVERY CLEAN: -all steps, continues steps until mode is completed and then the train proceeds to SHUTDOWN - step 1.		Sn	C	Y			
16-YA-402	RAS Pump 16-P-402-X fail	16-P-402-X	Alarm						IN ALL MODES: When the pump is requested to run and the running signal is not received for 5 seconds. IN ALL MODES: -all steps, when the pump is running.	When the recirculation pump is placed into auto or manual start. When lead is switched.	IN ALL MODES: -all steps, changes the lead of the pumps. Lead is not switched if the other pump is not available. Callout IN MAINTENANCE CLEAN & RECOVERY CLEAN: -all steps, continues steps until mode is completed and then the train proceeds to SHUTDOWN - step 1. IN ALL MODES: -all steps, when the lead pump is not available, (Pump is available if in Auto at HMI).		A	C	Y			
16-KYI-402-X	RAS Pump Lead Alternating Time	16-P-402-X	Info		72	24	12		IN ALL MODES: -all steps, when the pump is running.	When lead is switched.	This is the actual accumulated run time of the equipment. This is not displayed.				Y			
	RAS Pump Alternating Lead	16-P-402-X	Info						IN ALL MODES: -all steps, when the accumulated run time is equal to or greater than 16-KYI-402 and the lead pump is not running. On all steps, when the lead pump is not available, (Pump is available if in Auto at HMI).	When lead is switched.	IN ALL MODES: -all steps, changes the lead of the pumps. Lead is not switched if the other pump is not available. Callout IN MAINTENANCE CLEAN & RECOVERY CLEAN: -all steps, continues steps until mode is completed and then the train proceeds to SHUTDOWN - step 1.				Y			
16-FAHH-400	Recirculation Flow High	16-FIT-400	Alarm				205	M3HR	When the recirculation flow has been at or above this setpoint for 10 seconds.	When the flow is below this setpoint.	Callout. Put the recirculation pump 16-P-402-x in Manual Stop.	Alarm Message	A	C	Y			
16-FALL-400	Recirculation Flow Low	16-FIT-400	Alarm				135	M3HR	When the recirculation pump has been running for 10 seconds and the flow has been at or below this setpoint for 10 seconds.	When the reset button is pressed. The operator has to put the equipment back into Auto.	Callout. Put the recirculation pump 16-P-402-x in Manual Stop.	Alarm Message	A	C	Y			
16-FIT-400	RAS Flow To Bioreactor	16-FIT-400	Analog In		0	300		M3HR			Displays value with engineering units on screen. Actual instrument is 16-FE/FIT-400				Y			
16-FA-400	RAS Flow Transmitter Out of Range	16-FIT-400	Alarm						IN ALL MODES: When the transmitter is out of range by 1% of the calibrated range for 2 seconds. (i.e. calibrated range = range max. - range min.)	When the transmitter is in range.	IN MAINTENANCE CLEAN & RECOVERY CLEAN: -steps continue		A	C	Y			
16-FOI-400	Today's Total Plant RAS Volume	16-FIT-400	Computed		0	10000		mg/l		At midnight, totalizer is reset to zero.	Totalized flow through all 16-FIT-400				Y			
16-FOI2-400	Yesterday's Total Plant RAS Volume	16-FIT-400	Computed		0	10000		mg/l			At midnight this value is stored at 16-FOI2-400				Y			

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Alarm Type	Severity	Log	Position	Notes	
<b>BACKPULSE SYSTEM</b>																	
20-KTY-8800	Backpulse or Relax Duration		Setpoint		20	120	30	Seconds	IN BACKPULSE - step 3.	When timer times out.	IN RELAX & BACKPULSE: - starts timer. Proceeds as per OSC when timer times out.						
20-FAHH-8820	Backpulse Flow High High	20-FIT-301	Alarm				TBD	M3/HR	IN RELAX - step 2. In Backpulse: When the Permeate Backpulse Pump has requested to run and the flow has been at or above the setpoint for 3 sec.	When the reset button is pressed. The operator has to put the equipment back into Auto.	IN BACKPULSE: - all steps, proceeds to SHUTDOWN - step 1.	Sn C	Y			Setpoint adjustment on popup screen and graphic indication for train setpoints.	
20-FALL-8820	Backpulse Flow Low Low	20-FIT-301	Alarm				TBD	M3/HR	When the Permeate Backpulse Pump has requested to run and the flow has been at or below the setpoint for 10 sec. In Production: When 20-LSL-001 is active for 3 sec	When the reset button is pressed. The operator has to put the equipment back into Auto.	IN BACKPULSE: - all steps, proceeds to SHUTDOWN - step 1.	Sn C	Y			Alarm Message	
20-LAL-001	Backpulse Tank Level low	20-LSL-001	Alarm							When 20-LSL-001 is not active.	Callout. IN BACKPULSE: De-energize the output to the pump and continues the backpulse when pump is ready for start. - all steps, proceeds to the next step. - switch the mode of all trains to RELAX IN M-CLEAN OR R-CLEAN: Put the permeate backpulse pump in Auto Stop. De-energize the output to the chemical pumps. When the alarm is cleared, the PLC continues in the step after the permeate backpulse and chemical pumps start.						Alarm Message
20-LAH-001	Backpulse Level High High	20-LSH-001	Alarm						In Production: When 20-LSH-001 is Active for 3 sec	When 20-LSH-001 is not active	Close 20-FV-003	A	N	Y			
20-PDAH-000	Backpulse TMP High High	20-PIT-300	Alarm	TMP	0	0.502	0.502		In Backpulse: When the TMP is at or above this setpoint for 8 sec during Backpulse	When the reset button has been pressed	IN BACKPULSE: The Train Process to FAULT-step-1					Display of alarm message	
20-PDVH-000	TMP High Trigger	20-PIT-300	Info	TMP	0.14	0.482	0.482		IN BACKPULSE, MAINTENANCE CLEAN & RECOVERY CLEAN & RECOVERY CLEAN: - all steps, when the TMP is at or above this setpoint, then CV by 0.25% every second until it reaches 100	IN ALL MODES: - all steps, when the TMP is CLEAN below the setpoint, then CV by 0.25% every second until it reaches 100	IN BACKPULSE, MAINTENANCE CLEAN & RECOVERY - all steps, captures the initial value for the maximum of the 20-FIC-820-X CV at: - all steps, captures the maximum CV = (CV value of 20-FIC-8820-X) : 0.25 Then reduces the maximum value for 20-FIC-8820-X CV by 0.25% every second until it reaches to its minimum of 25%.						
20-PDH-000	TMP High Display	20-PIT-300	Info	TMP					IN BACKPULSE, MAINTENANCE CLEAN & RECOVERY CLEAN: - steps as per the OSC.	IN PRODUCTION: - all steps, when the 20-FIC-8820-X CV is at 100%.	IN BACKPULSE, MAINTENANCE CLEAN & RECOVERY - all steps, captures the maximum value for 20-FIC-8820-X CV is limited to a value below 100%. Displays "TMP at limit" indication on the screen. Callout.						
20-PDAH-001B-X	CIP TMP High High	20-PIT-300	Alarm	Alarm					IN M-CLEAN OR R-CLEAN: When the TMP is at or above this setpoint for 8 seconds during BACKPULSE. The actual instrument is 20-PEPIT-301-X	IN M-CLEAN: Automatically reset in the next step. IN R-CLEAN: When the reset button is pressed. The operator has to put the equipment back into Auto.	IN M-CLEAN: De-energize the output to the chemical pumps and permeate backpulse pump. In the train start-up - step 1, Displays "Maintenance Clean Abort" IN R-CLEAN: Abort R-CLEAN. Put the permeate backpulse pump in Manual Stop. Put the train into OFF - Step 1. Display banner "Recovery Clean Abort". Operator enter HMI Setpoint. Common to both Trains.	Sn C	Y				
20-FCI-301	Backpulse Flow setpoint		Computed					M3/HR									

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Priority	Log	Revision	Notes	
<b>CLEAN IN PLACE (CIP) SYSTEM</b>																		
20-F4H-8120	CIP Flow High	20-FIT-301	Alarm				TBD	M3/HR	In M-clean or R-clean: When the permeate backpulses pump has been requested to turn and the flow has been at or above this setpoint for 5 sec. The actual instrument is 20-FE-FIT-301.	When the flow is below the setpoint.	IN MAINTENANCE CLEAN & RECOVERY CLEAN: - all steps, stop the output to the chemical pumps and permeate backpulse pump - cabout	Display of alarm message	Sn N	N	Y			
20-F4L-8120-X	CIP Flow Low	20-FIT-301	Alarm				TBD	M3/HR	In M-clean or R-clean: When the permeate backpulse pump has been requested to run for 10 sec and the flow is below this setpoint for 10 sec. The actual instrument is 20-FE-FIT-301.	When the flow is above the setpoint	NEUTRALIZATION: - all steps, proceeds to SHUTDOWN - step 1. - all steps, stop the output to the chemical pumps and permeate backpulse pump - cabout	Display of alarm message	Sn N	N	Y			
20-FC3-301	Maintenance Clean CIP Flow Setpoint	20-FIT-301	Computed		TBD	TBD	TBD	M3/HR										
20-FC3-301	Recovery Clean CIP Flow Setpoint	20-FIT-301	Computed		TBD	TBD	TBD	M3/HR										
<b>CIP-Citric Acid Chemical System</b>																		
Prevent Starting of Citric Acid Pumps																		
23-LAL-201	Citric Acid Tank Level Low	23-LSL-201	Alarm						When a Sodium Hypochlorite Pump is ON. OR When any train is in Maintenance Clean, Chrome Clean or Recovery Clean, Chrome Clean.	Books starting of any Citric Acid Pump. In auto or manual modes.								
23-P-200	Citric Acid Pump Control		Info						IN MAINTENANCE CLEAN & RECOVERY CLEAN: - all steps, when switch is active for 5 seconds.	When the 23-LSL-201 is not active	IN MAINTENANCE CLEAN & RECOVERY CLEAN: - all steps, stop the citric acid dosing pump	option to enter setpoint from HMI common for both the trains.	A	N				
<b>CIP-Sodium Hypochlorite Chemical System</b>																		
Prevent Starting of NaOCl Pumps																		
23-LAL-201	NaOCl Tank Level Low	23-LSL-201	Alarm						When a Citric Acid Pump is ON. OR When any train is in Maintenance Clean or Recovery Clean.	When the level is above the setpoint	IN MAINTENANCE CLEAN & RECOVERY CLEAN: - all steps, stop the dosing pump.							
23-P-210/23-P-220	NaOCl Control		Info						IN MAINTENANCE CLEAN & RECOVERY CLEAN: - all steps, when switch is active for 5 seconds.		IN MAINTENANCE CLEAN & RECOVERY CLEAN: There is a dosing pump. - start the Pump 23-P-200							
<b>CIP-Maintenance Clean</b>																		
20-KY1-8101	Initial and Final M-clean duration		Setpoint	M-Clean	10	120	60	seconds	The Duration of Initial and Final M-clean Pulse									
20-KY1-8102	Soak Duration Between M-clean chemical Pulse		Setpoint	M-Clean	10	300	270	seconds	Soak duration between M-clean chemical Pulse									
20-KY1-8103	M-clean Chemical Pulse Duration		Setpoint	M-Clean	10	120	20	Seconds	M-clean Chemical Pulse Duration									
20-KY1-8104	Number of M-clean Chemical Pulse Iteration		Setpoint	M-Clean	8	10	8	N/A	Number of M-clean Chemical Pulse Iteration									
Maintenance Clean to Occur on Given Day Enable Button																		
20-KY3-8100	Maintenance Clean CIP Aeration Step Timer		Info	Blower	0	600	300	seconds	IN MAINTENANCE CLEAN: - In aeration steps, as detailed in OSC.		Operator can select to have a Maintenance Clean on specific days of the week for a specific train. IN MAINTENANCE CLEAN: - In aeration steps, as detailed in OSC.							

ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Log	Revision	Notes
<b>CIP-Recovery Clean</b>																
20-KY4-8100	Recovery Clean CIP Aeration Step Timer		Setpoint	Blower	0	600	300	seconds	IN RECOVERY CLEAN; - in aeration steps, as detailed in OSC.		IN RECOVERY CLEAN; - in aeration steps, as detailed in OSC.					
20-KY23-8100	Recovery Clean Pulse Duration		Sequencer	R-Clean	30	7200	120	seconds	IN RECOVERY CLEAN; - steps as noted in the OSC.		IN RECOVERY CLEAN; - steps as noted in the OSC, this is the steps duration.					
20-KY29-8100	Recovery clean Flush Soak Duration		Sequencer	R-Clean	30	3600	3600	Seconds	IN RECOVERY CLEAN; - steps as noted in the OSC.		Consult the OSC, Recovery Clean steps, for details.					
20-KY5-8100	Recovery Clean Flush Aeration Step Timer		Setpoint	Blower	0	600	300	seconds	IN RECOVERY CLEAN; - in aeration steps, as detailed in OSC.		IN RECOVERY CLEAN; - steps as noted in the OSC, this is the steps duration.					
20-KY2-8101	Initial and Final R-clean Pulse Duration		Sequencer	R-Clean	10	120	00	seconds	The duration of Initial and Final chemical R-CLEAN Pulse							
20-KY2-8102	Soak Duration Between R-clean chemical Pulse		Setpoint	R-Clean	10	300	270	seconds	Soak duration between R-clean chemical Pulse							
20-KY2-8103	R-clean Chemical Pulse Duration		Setpoint	R-Clean	10	120	30	Seconds	R-Clean Chemical Pulse Duration							
20-KY27-8101	R-Clean Extended Soak Duration		Setpoint	R-Clean	5	12	6	hours	R-clean Extended Soak Duration							
20-KY28-8100	R-Clean Soak Extended Soak - Mixing Frequency		Setpoint	R-Clean	0.30	300	00	seconds	IN RECOVERY CLEAN; - in extended soak step, and every line 20-KY29-8100 times out.		IN RECOVERY CLEAN; - setpoint is mixing duration with air in extended soak step. - aerates the membrane tank for 20-KY28-8100 seconds every 20-KY29-8100 seconds. Starts step with no mixing.					
20-KY29-8100	R-Clean Soak Extended Soak - Mixing Frequency		Setpoint	R-Clean	600	7200	1200	seconds	IN RECOVERY CLEAN; - as per OSC.		IN RECOVERY CLEAN; - setpoint of 0 indicates no during the soak step. - starts mixing frequency. Timer resets when it times out. - aerates the membrane tank for 20-KY28-8100 seconds every 20-KY29-8100 seconds. Starts step with no mixing.					
20-KY5-8101	Neutralization Aeration Step Timer		Sequencer	R-Clean	3	900	00	seconds	IN RECOVERY CLEAN; - as per OSC.		IN RECOVERY CLEAN; - steps as noted in the OSC, this is the steps duration.					
20-KY30-8100	Neutralization Soak Duration		Sequencer	R-Clean	3	1200	900	seconds	IN RECOVERY CLEAN; - as per OSC.		Consult the OSC, Recovery Clean steps, for details.					
20-HIS30-3000-x	Rinse Button		Sequencer	R-Clean					When the button is pressed	When the train is in the selected step.	IN RECOVERY CLEAN; - steps as per OSC, proceeds according to the OSC.					
20-HIS31-3000-x	Resume Neutralization Button		Sequencer	R-Clean					When the button is pressed	When the train is in the selected step.	IN RECOVERY CLEAN; - steps as per OSC, proceeds according to the OSC.					
20-HIS32-3000-x	Confirm Neutralization Button		Sequencer	R-Clean					When the button is pressed	When the train is in the selected step.	IN RECOVERY CLEAN; - steps as per OSC, proceeds according to the OSC.					
<b>Priming System</b>																
20-PCYL-3423	TMP Trigger for Extra Air Removal		Controller		0	-0.422	-1.004	kg/cm2	IN PRODUCTION; - all steps, if the TMP is at or below the setpoint for 30 seconds.	IN PRODUCTION; - ONCE IN STEP-2	IN PRODUCTION; - step 1. Ejector Compressed Air Valve 20-FV-901-1 and 20-FV-802-2 opens.					
90-PAL-100	Air compressor pressure Low	90-PSL-100	Alarm							When the reset button is pressed	IN ALL MODES; - when the air compressor low pressure switch is active		Sn N			Displays an alarm banner "Low Air pressure"



ZMOD 320516 Control Logic Chart

Tag	Description	Loop Tag	Type	Sub Type	Range Min	Range Max	Setpoint	Units	Set Derivation	Reset	Action	Operator Interface	Alarm Type	Severity	Log	Position	Notes	
<b>Power System</b>																		
00-UA-0000	General Callout		Alarm	Control					When any condition requiring a callout is activated	When the conditions requiring the callout are cleared	Energize the auto drier output relay and the alarm light on the panel door							
00-JAL-0001	Plant Power Lost		Alarm	Plant					When the system detects that power is lost	When the trip condition is cleared	Turn off all the equipment Go to Startup Step 1.  The system blocks all ball sate inputs that are normally closed (to avoid nuisance alarms) This startup sequence shows the order in which the devices in the plant are re-enabled after a power interruption or after an emergency stop has been reset. ZeeWeedB trains that were in STANDBY - PRODUCTION, BACKPULSE/RELAX or MAINTENANCE CLEAN prior to the power failure, will proceed to STANDBY - step 1. ZeeWeedB trains that were in RECOVERY CLEAN, prior to the power failure, will proceed to OFF - step 1. Displays on alarm screen: Maintenance Clean Aborted or Recovery Clean Aborted							
00-JAL-0002	AC Power Out of Phase		Alarm	Plant					When the AC monitor detects power out of phase	When the trip condition is cleared	Turn off all the equipment Go to Startup Step 1.  The system blocks all ball sate inputs that are normally closed (to avoid nuisance alarms) Turn off all the equipment Go to Startup Step 1. The system blocks all ball sate inputs that are normally closed (to avoid nuisance alarms)	Alarm message	Sn C	Y				
00-JAL-0003	System Stop Button Emergency Pump Button		Alarm						When System Stop Button is pressed	When the conditions requiring the callout are cleared	All trains proceed to POWER OFF until power is resumed and the train is enabled.  ZeeWeedB trains that were in STANDBY - PRODUCTION, BACKPULSE/RELAX or MAINTENANCE CLEAN prior to the power failure, will proceed to STANDBY - step 1 as per the start-up sequence. ZeeWeedB trains that were in RECOVERY CLEAN, prior to the power failure, will proceed to OFF - step 1 as per the start-up sequence. Displays on alarm banner: Recovery Clean Aborted - A delay is provided in each step to allow for devices to start up before the next step. Steps are stopped for those devices which are not ready. Allows utility air compressors to run if required. Allows transmitters to warm up and complete a self diagnostics. Displays "Power-up Delay" on the screen.	Alarm message	Sn C	Y				
00-JAL-0004	PLC Battery Low		Alarm						When PLC Battery is low	When the conditions requiring the callout are cleared	This startup sequence shows the order in which the devices in the plant are re-enabled after a power interruption or after an emergency stop has been reset.  All trains proceed to POWER OFF until power is resumed and the train is enabled.  ZeeWeedB trains that were in STANDBY - PRODUCTION, BACKPULSE/RELAX or MAINTENANCE CLEAN prior to the power failure, will proceed to STANDBY - step 1 as per the start-up sequence. ZeeWeedB trains that were in RECOVERY CLEAN, prior to the power failure, will proceed to OFF - step 1 as per the start-up sequence. Displays on alarm banner: Recovery Clean Aborted - A delay is provided in each step to allow for devices to start up before the next step. Steps are stopped for those devices which are not ready. Allows utility air compressors to run if required. Allows transmitters to warm up and complete a self diagnostics. Displays "Power-up Delay" on the screen.	Alarm message	Sn C	Y				
	Startup Step 1		Info															
	Startup Step 2		Info						60 seconds after start of step 1		Re-enables all common, non-sequences valves. Enable all the Transmitters.							
	Startup Step 3		Info						15 seconds after start of previous step		Allows Process Blowers to run if required.							
	Startup Step 4		Info						30 seconds after the start of the previous step. There is no delay if the device in the previous step is not required.		Allows screens and mixers to run if required.							
	Startup Step 5		Info						30 seconds after the start of the previous step. There is no delay if the device in the previous step is not required.									
	Startup Step 6		Info						30 seconds after the start of the previous step. There is no delay if the device in the previous step is not required.		Allows train 1 & 2 to come out of POWER OFF mode. Train proceeds to either STANDBY - step 1 or OFF - step 1. See start-up sequence step 1 for more details.							
## To be decided based on the selected pump model																		

**ZMOD 320386 Control Logic Chart**

<b>Tag</b>	Tag name for the element. An "X" in the tag's suffix may be used to represent identical elements, if usage of that "X" is consistent with the P&ID tagging convention.
<b>Description</b>	Description for the element.
<b>Type</b>	Purpose for the element. Predefined types will prompt the use of defined and standardized programming practices. The following predefined types are available:
<b>Alarm</b>	Notifies an operator with an alarm message at the operator interface.
<b>Analog In</b>	A reading from a field instrument.
<b>Comm</b>	A variable or a set of variables that are communicated to or from the PLC via a networked communications architecture.
<b>Computed</b>	Calculates a numeric value for use in a PLC program and/or display at an operator interface.
<b>Controller</b>	Calculates a continuous or binary output for regulating a process variable.
<b>Info</b>	General information for a programmer or any user of the CLC.
<b>Motor</b>	Sets a command from the PLC to run a motor, or other similar device.
<b>Selector</b>	An operator or automatic selection, usually with three or more possible values. The output variable is usually an integer word or boolean array in a PLC, with one and only one bit on at a time.
<b>Sequence</b>	Directs the automatic operation of pumps, valves, and other control devices through a series of operations.
<b>Setpoint</b>	A numeric value for use in a PLC program that can be adjusted by a user at an operator interface.
<b>Switch</b>	A discrete value for use in a PLC program and/or display at an operator interface.
<b>Totalizer</b>	Calculates a totalized value.
<b>Valve</b>	Sets a command from the PLC to open a valve.
<b>Sub Type</b>	Further breakdown of the type category.
<b>Loop Tag</b>	A grouping of elements with a common purpose. If W&PT standard tagging has been applied on the P&ID, the element tags are derived from the loop tags. For example, transmitter 34-FIT-211 contributes to flow loop 34-F-211, and motor pushbutton 34-HS-101 contributes to motor loop 34-M-101. If custom tagging has been applied on the P&ID, abbreviated text or an extrapolation of the custom tagging convention may be used for a grouping of elements.
<b>Range Min &amp; Max</b>	The range of the numerical value of the produced data, or the entry limits for the setpoint that is used to trigger the produced data. The number of decimal places shown indicates the resolution at the operator interface. For example, 0.0 to 10.0 psig.
<b>Setpoint</b>	The default value for a given setpoint.
<b>Units</b>	The engineering units of the produced data or setpoint.
<b>Set/Derivation</b>	The conditions for setting or calculating the produced data. Used by the programmer to create the produced data.
<b>Reset</b>	The conditions for reset of the produced data.
<b>Action</b>	The action that occurs when the produced data is set. Also used to explain the intent or usage of the produced data.
<b>Operator Interface</b>	A description of programming on the operator interface for monitoring and/or control of the produced data.
<b>Alarm Type</b>	A classification of the alarm generated by the PLC program when the element is true. A = Advisory S = Shutdown Sn = Normal Shutdown Si = Immediate Shutdown blank = no alarm
<b>Severity</b>	To differentiate the urgency for an operator to respond to particular alarms. C = Critical Alarm N = Noncritical Alarm
<b>Log</b>	Flags the element as a data point to be logged by data acquisition software.
<b>Revision</b>	Flags the element as changed since an earlier revision of the document, with reference to the revision identifier associated with the change.
<b>Notes</b>	Generally used for notes or comments that are not required for programming, including explanation of a recent revision or explanation of a unique customization.

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## **SERV-0001 ZeeWeed Membrane Care, Handling and Storage 500 a/b, 500c, 500d, ZW1000**

### **1.0 Purpose**

The purpose of this document is to outline the requirements associated with the receipt, unloading and storage of ZeeWeed® membranes and associated cassette assemblies. Information is also included on storing wetted membranes. If, after reading this document, questions exist on proper membrane handling, please contact your GE Water representative.

Although the ZeeWeed® membranes are designed for maximum durability in water filtering applications, membranes are susceptible to irreversible damage if mishandled. Any concerns regarding membrane handling and potential damage should be addressed with GE Water staff directly before any activities are undertaken at site that may cause an increased potential for membrane damage to occur. It should also be confirmed in advance that suitable Builders All Risk Insurance coverage is in place or other insurance coverages as deemed necessary by the project contract.



**The installer in charge of the site is responsible for taking all reasonable precaution to prevent damage during installation and to prevent debris and foreign objects from falling in the membrane tanks after the cassettes are installed.**

### **2.0 Applicability and Revisions**

This document covers the ZeeWeed® product line, including all ZeeWeed 500 and 1000 series modules/elements and cassettes. Three important documents to accompany this procedure include:

- I. **Equipment Acceptance Certificate and Checklist** - a document used to confirm the receipt of the goods to the satisfaction of the receiver (for membrane shipments, typically the Installer).
- II. **Membrane Pre-Installation Checklist** - a checklist to be completed by the Installer prior to membrane uncrating and installation.
- III. **ZeeWeed® Cassette Installation Procedure** - a procedure specific to each membrane type that details the steps involved in uncrating and installing new membrane cassettes (either ZeeWeed® 500c, ZeeWeed® 500d or ZeeWeed® 1000).


Contact your GE Water Lifecycle Services for clarification as necessary.  
 Printed Document not controlled.

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### 3.0 Definitions


- Installer** - Organization that is contractually responsible for the project site.
- ZeeWeed®** - An ultrafiltration membrane in which the membrane surface is cast onto the outside of long thin hollow fibres. A large number of fibres are bound together in a top (sometimes also a bottom) collection header.
- Module/Element** - An assembly to house and contain the membrane fibre. One ZeeWeed® membrane, containing numerous individual fibres grouped together, is called a module or an element. See pictures to the right.




500c



500d



ZW1000



ZW1000 V3

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### 4. Membrane Shipment

During shipping of the ZeeWeed® membranes from the GE Water manufacturing facility to the intended site, the following conditions must be met:

- Shipment temperatures are to be controlled in the range of 2 - 35°C (35° - 95°F) (Setpoint 20° C or 68°F)
- The shipping crates housing the membrane cassettes should never be exposed to excessive vibration or large bumps. When shipping membrane cassettes by rail or truck, care is to be taken to ensure that air suspension cars or trailers are utilized.

In most cases membranes will be shipped in populated cassette form (modules are already installed) in cassettes.

Contact your GE Water Lifecycle Services for clarification as necessary.  
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## **SERV-0001 ZeeWeed Membrane Care, Handling and Storage 500 a/b, 500c, 500d, ZW1000**

### **5. Handling of Factory Shipped GE Water Membranes**

#### **5.1 General Information**

##### **Cassettes**

- Membrane cassettes are shipped in a plywood packing crate.
- The cassette itself is sealed in a plastic bag to retain moisture and prevent damage to the membranes due to drying.

##### **Modules/Elements**

- Individual membrane modules/elements are shipped in a cardboard box within a crate.
- The module or element itself is sealed in a plastic bag to retain moisture.
- Modules or elements in cardboard boxes should not be stacked more than six high.

#### **5.2 Unloading Membranes**

The Installer is responsible for the prompt and proper unloading of all membrane equipment and materials received into his custody.

- Dock level, off-loading facilities are recommended.
- The wooden shipping crates have been designed to be lifted from the bottom using a forklift.

**Note that extended forks and an appropriately sized lift are required for the 500d product.**

- Damage incurred or observed during equipment off-loading needs to be immediately reported to your GE Water representative.



- It is recommended that an experienced/qualified forklift truck driver unloads the membranes from the carrier.
- 500d and ZW1000 cassettes are shipped on their sides and will require uprighting - follow all procedures carefully to prevent injury
- Shipping crates are not to be stacked!

Contact your GE Water Lifecycle Services for clarification as necessary.  
Printed Document not controlled.

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**5.3 Confirmation of Equipment and Materials**

- A cross-check should be performed on the shipment using the packing slip to confirm the delivery of membrane equipment.

**Note: membrane crates are not to be opened! Verification should be limited to external examination of crates.**

- The equipment delivery will be checked for content and any damage that may have occurred during shipping or the unloading process.
- Any non-conformance shall be immediately reported to your GE Water representative (in writing). Digital pictures of damage should be provided.
- Refer to section 5.4 for "Confirmation of Handling Indicators"
- Once the equipment shipment has been checked, the document provided by GE Water (ref. "Equipment Acceptance Certificate and Checklist") is completed and signed by the Site Organization's representatives.
- The Installer shall expeditiously replace all materials and equipment that are lost or damaged while in the custody of the Installer.
- Replacement materials and equipment of a type and quality equal to the original materials and equipment shall be acceptable to GE Water and to the Owner.

**5.4 Confirmation of Handling Indicators**

GE Water includes a series of Shipping Indicators to protect the integrity of the membrane cassettes while they are being shipped. Indicators may include Freeze and/or Heat.

- The Installer's representative should document the indicator condition on the indicator check label located on the membrane crate.
- At the time of discovery the installer must inform the ZENON representative of any triggered indicators. (A triggered indicator indicates ideal shipping conditions were not maintained. The ZENON FSR will evaluate membranes prior to installation).
- During membrane installation, the GE Water Representative onsite will also inspect and record the status of all indicators.

	Freeze Indicator	Heat Indicator
<b>Indicator Location:</b>	External	External
<b>When to Check:</b>	At time of receipt	At time of receipt



Note: Duplicate indicators are inside crate. These indicators are for ZENON FSR use.

Contact your GE Water Lifecycle Services for clarification as necessary.  
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### **SERV-0001 ZeeWeed Membrane Care, Handling and Storage 500 a/b, 500c, 500d, ZW1000**

#### **6.0 Storage of Membranes**

The Installer shall provide all facilities and services required for the storage, maintenance, protection and security of the equipment and materials delivered by ZENON.

The following conditions should be followed:

- Equipment and materials shall be stored in assigned lay-down areas.
- Stored equipment and materials shall be adequately supported and protected to prevent damage.
- Equipment shall be moved into the permanent building or onto its permanent foundation as soon as construction will permit.
- Stored materials and equipment shall not be allowed to contact the ground. In warehouses that do not have dry concrete or suspended floors, materials and equipment shall be stored on platforms or shoring.
- Indoor storage furnished by the Installer shall consist of suitable construction trailers or portable enclosures and shall be weather-tight, well ventilated, and secure against theft and vandalism.
- Access doors shall be adequate to accommodate the movement and handling of materials and equipment to be stored and shall be equipped with secure locks.
- Membrane cassettes will be stored upright on a level surface.
- The membrane cassette crates must remain closed until the Installer begins membrane installation to prevent permanent membrane damage due to drying out.



**Membranes should be stored in a dark dry area with a storage temperature between 5° - 35° C (40° - 95° F)!**

#### **6.1 Storage Conditions - Crated Cassettes**

The following conditions should be ensured when storing crated cassettes:

- Stored in a sheltered area protected from freezing, direct sunlight or extreme heat.
- Vacuum sealed bag should remain sealed until membrane installation is being performed.

It is recommended that the cassettes be stored no longer than necessary prior to installation. Coordinate with GE Water for appropriate shipment times. Maximum storage duration of a cassette is 12 months from the date of shipment.

Contact your GE Water Lifecycle Services for clarification as necessary.  
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### **SERV-0001 ZeeWeed Membrane Care, Handling and Storage 500 a/b, 500c, 500d, ZW1000**

#### **6.2 Storage Conditions – Bagged Modules / Elements:**

New modules / elements preserved with glycerin solution, bagged and factory sealed, may be stored for up to 12 months. The following conditions should be ensured when storing bagged modules / elements:

- Stored in a sheltered area protected from freezing, direct sunlight, extreme heat and winds that could accelerate drying.
- The module / element should be kept bagged and sealed at all times.

Disassembly of cassettes to replace modules/elements requires attention and care. Contact GE Water for re-assembly procedures, which include step-by-step instructions, bolt torques, and identification of non-reusable hardware.

#### **6.3 Storage Conditions – Wetted Membranes**

It is important to note that ZeeWeed® membranes should not be allowed to dry out as membrane properties will be adversely affected. **Drying may result in irreversible damage to the membranes.**

If the preservative is flushed out or if the module has been in contact with water, the membrane must not be allowed to dry out under any circumstances. The membranes may be left in air for a maximum of forty-five minutes out of direct sunlight and wind. After forty-five minutes, membranes should be immersed in water. Spraying the membranes after this period is not sufficient to prevent drying-out and will not allow a longer period of contact with air. If membranes are **frequently lightly misted** (not sprayed with fire hoses or pressure washers) from the time they have been taken out of the water, they may be left in air for a maximum of 6 hours (5° - 35°C (40° - 95°F)). Since the membranes are maintained wet, there is no need for specific re-wetting procedures. However, if necessary for other reasons (e.g., drinking water compliance, residual of preservatives) the standard procedures for rinsing and disinfection may be used before starting the operation. If it is impractical to immerse or repeatedly spray the membrane, the membrane should be cleaned, preserved in glycerin solution and re-bagged according to membrane preservation procedures. Please refer to the Operations and Maintenance manual supplied with the system for further information.

Longer storage durations are to be discussed with GE Water on a case by case basis.

Every effort has been made by GE Water and Process Technologies Canada (GE) to provide current information while preparing this procedure. GE maintains that depictions of methods and/or techniques and use of specific tools and/or apparatus shown within the situations portrayed are accurate at the time of printing. GE accepts no liability for any reliance placed on the information contained herein.

Contact your GE Water Lifecycle Services for clarification as necessary.  
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### **SERV-0001 ZeeWeed Membrane Care, Handling and Storage 500 a/b, 500c, 500d, ZW1000**

#### **6.4 Storage Durations – Wetted Cassettes**

When membranes have been installed in a tank, they need to be kept wet at all times. When the protective glycerin solution is removed, the membranes become susceptible to drying.

For storage periods of up to approximately 15 days, simple immersion of the cassettes in water containing sodium hypochlorite (NaOCl) with a maximum residual concentration of 3 mg/L is suitable. Residual should be monitored every week and re-dosing will be required if the residual drops to less than 0.2 mg/L. Recovery cleaning of the membrane prior to storage is strongly recommended. If the membranes have been in service in a MBR application, inspection and debris removal (if necessary) of the membrane prior to storage is also required. Periodic aeration may also be necessary to prevent anoxic or anaerobic conditions from developing in the tank. Daily testing of the water to ensure that the residual chlorine concentration is within acceptable limits is required; a simple swimming pool chlorine test kit is acceptable. A log is to be maintained recording daily NaOCl concentration and water temperature. Longer storage durations are to be discussed with GE Water on a case-by-case basis.

#### **6.5 Wetted Membranes – Long term removal from water**

If membrane cassettes are to be re-configured or rebuilt for any reason, GE Water Field Service Representatives are required to maintain warranty. If short-term storage (<15 days) refer to section 6.4 in this document. If the module is to be out of service for a longer period, the module/cassette must be preserved and stored.

- Perform a recovery cleaning on membrane modules (refer to the appropriate process manual).
- Ensure that no sludge or solids are present on the membranes.

Please contact GE Water Customer Service for proper preservation instructions.



**In the case that the membranes have spent time in storage, carefully check for any signs of mold on the fibres. Should any mold be present, immediately rebag and follow through with the steps outlined in SERV-0056 Disinfection of Moldy Cassettes/Modules.**

**Contact your GE Water Representative for advice on returning a sample for analysis.**

Contact your GE Water Lifecycle Services for clarification as necessary.  
Printed Document not controlled.

<b>DO's AND DON'T</b>
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**DO'S**

1. Clean the air filter on Air Blowers regularly. Change the Air Filters Periodically.
2. Maintain the MLSS level in Bio reactor as specified during actual commissioning of the plant, drain out the excess sludge from tank through drain.
3. Run the blower continuously.
4. Changeover from one blower to another after every Shift.
5. Ensure the min. dissolved oxygen level in FAB reactor tank is 2 mg/l.
6. Regularly follow the lubrication and maintenance schedule for all mechanical moving items.
7. Take composite samples from the locations specified. Analyze them and maintain logbook regularly.
8. Remove sludge from sludge holding tank regularly.

**DON'TS**

1. Don't let acidic pH < 6 or alkaline pH > 8.5 or hot (temp. > 38 Deg. °C) effluent reaches the FAB reactors in any case.

<b>SAMPLING AND ANALYSIS</b>
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Sampling and analysis of the effluent should be done to check the quality of waste and performance of each unit.

**Samples should be taken and analyzed at the following points –**

1. At the inlet of FAB reactor – I (After Equalization tank)
2. At the outlet of Anoxic Tank
3. At the outlet of Aerobic Tank
4. At the outlet of MBR

**METHODS OF SAMPLING**

Samples collected must be representative in nature otherwise laboratory analysis will be misleading. Careless collection of samples would lead to wrong conclusions. Sampling point should be selected where wastewater is homogenous in nature. Care should be taken to avoid entry of extraneous material such as scum and floating matter into sampling bottles.

**COMPOSITE SAMPLES**

Composite samples are required to see performance of the units. For this the samples shall be collected every 4 hours. The samples thus collected shall be then mixed together for making a Composite Sample. e.g. For making a Composite Sample at FAB Reactor Inlet , take the samples at FAB inlet every 4 hours & the samples thus collected shall be mixed together to have a composite sample of the day.

**SAMPLE VOLUME**

About one to two liters of sample are adequate for the parameters required for process control. Samples should be immediately transported to laboratory for analysis. In case there is some delay, proper preservation like keeping the samples in ice should be done

**ANALYSIS**

The samples shall be analyzed for various parameters as listed in daily Sampling & analysis Schedule. The Samples can be analyzed from nearest laboratory or in the inhouse laboratory if available.

**DAILY SAMPLING & ANALYSIS SCHEDULE**

S · N O ·	SAMPLE POINT	SAMPLIN G TYPE	PARAMETERS TO BE ANALYSED				
			pH	SS	O&G	BOD	COD
1.	Effluent at the inlet of FAB	Composite	•	•	•	•	•
2.	At the outlet of Anoxic Tank	Composite		•	•	•	•
3.	At the outlet of Aerobic	Composite		•	•	•	•
4.	At the outlet of MBR	Composite		•	•	•	•

## ROUTINE AND EMERGENCY INSPECTION

Remove accumulation of debris from inlet channel and outlet V-notch if provided Chamber. All the tanks, baffles and weirs should be inspected and cleaned daily. · All the vertical walls and channels should be cleaned by squeeze. · All the mechanical equipment should be inspected for normal trouble free operation.

If the colour of the wastewater is changed in any unit, samples should be taken immediately to investigate the cause of the problem.

Inspect sludge collection and other equipment annually for the indication of corrosion.

**EMERGENCY INSPECTION**

In case of any serious problem with any unit, feeding should be stopped immediately to that unit. Drain all the wastewater from the unit and inspect carefully the structure, unusual deposition, each and every part of mechanical equipment, etc. All the mechanical equipment should be made in good working condition. Unit should be cleaned properly before making the same operational again.

**PLANT SHUT DOWN**

In case plant needs to be shut down for a considerable period of time, following should be observed

- Close inlet valve to plant and open bye-pass valve if any.
- Thus effluent will not be received in the plant.
- Pump out effluent from intermediate sump. Open drain valves of tank and drain out the contents.
- The equipment then should be flushed with clear water.

**Biochemical Oxygen demand (BOD) Outline of the Method**

Bio chemical oxygen demand (BOD) is the quantity of oxygen required by a definite volume of the liquid effluent for oxidizing the organic matter contained in it by microorganisms under specified conditions. For its determination, the dissolved oxygen content of the sample, with or without dilution, is measured before and after incubation at 20 Deg.C. For 5 days.

**Apparatus Required**

Glass stopper bottles, narrow neck bottles of about 300 ml capacity, with suitable water sealing.

**Reagents Required**

- Sodium Hydroxide Solution - approximately 1 N.
- Hydrochloric acid - approximately 1 N.
- Sodium sulphite solution - Dissolve 5 g of anhydrous sodium sulphite in 1liter of water. Prepare fresh solution daily for use.
- Dilution water - Distilled water of good quality, free from metals, particularly copper, and aerated.
- Phosphate buffer solution - Dissolve 5g of potassium dihydrogen phosphate (KH<sub>2</sub>PO<sub>4</sub>), 2.75g of dipotassium hydrogen phosphate (K<sub>2</sub>HPO<sub>4</sub>), 3.4 g of disodium hydrogen phosphate (Na<sub>2</sub>HPO<sub>4</sub> 7H<sub>2</sub>O) and 7 g of ammonium chloride in about 500 ml of water and dilute to 1 liter.
- Magnesium Sulphate Solution - Dissolve 22.5 g of magnesium sulphate in water and dilute to 1 liter.
- Calcium chloride solution - Dissolve 27.5 g of anhydrous calcium chloride in water and dilute to 1 liter.
- Ferric Chloride Solution - Dissolve 0.25 g of ferric chloride (FeCl<sub>3</sub>. 6H<sub>2</sub>O) in water and dilute to 1 liter.

- Seeding Material - Supernatant liquor of domestic sewage stored for 24 to 36 hours at 20 Deg.C. In the case of industrial effluent containing organic compounds, which are not easily oxidized by sewage seed, the receiving water collected about 3.5 km below the discharge point may be used.

### Test Procedure

- Samples containing acidity or caustic alkalinity should be neutralized to pH about 7.0 with sodium hydroxide solution or hydrochloric acid respectively by adding a predetermined quantity.
- Samples containing residual chlorine or chloramines should be dechlorinated if chlorine is not dissipated on standing for 2 hours. To dechlorinate, first determine the quantity of sodium sulphite solution required for a known aliquot of the sample by titration to starch-iodide end point. After acidifying the sample with acetic acid (1:1) or sulphuric acid (1:50) followed by 10ml of 10 percent potassium iodide solution. Then add to the requisite volume of the sample the predetermined quantity of sodium sulphite, avoiding any excess, and check for the absence of chlorine after 20 minutes.
- Samples containing toxic substances in large amounts would require special treatment. However, the effect of small amount may be overcome by using the proper dilution so that toxicity is removed and the maximum BOD value is obtained. If increasing dilution's show increasing BOD, the dilution should be increased to a level where BOD levels off at a maximum.
- To check the quality of the dilution water and the effectiveness of the seed, determine the BOD of a standard solution of 300 mg/l either glucose or glutamic acid in the dilution water. Standard glucose solution should show a BOD of  $224 \pm 10$  mg/l and glutamic acid  $217 \pm 10$  mg/l.
- Store the dilution water at 20 Deg.C. and use when near that temperature. Take the desired volume of dilution water required for the test sample and add, for every 1 liter of water, 1 ml each of phosphate buffer solution, magnesium sulphate solution, calcium chloride solution and ferric chloride solution. Seed the dilution with seeding material. The quantity of seeding material (0.1 to 1 percent of settled sewage or 1 to 5 percent receiving water) added should be such that oxygen depletion in the dilution water control is between 0.2 and 0.8 mg/l after incubation at 20 Deg 'C. for 5 days.
- Prepare as follows several dilution's of the sample (usually 0.1 to -0 percent for strong industrial effluents and 5 to 25 percent for treated effluent) so as to obtain a depletion of at least 2 mg/l of dissolved oxygen after incubation for 5 days. In the case of dilution's greater than 1:100 prepare a 10 percent primary dilutions in a volumetric flask and from this make the final dilutions.
- Siphon carefully the prepared seeded dilution water into a graduated 1000 ml measuring cylinder and fill to the 500 ml mark. Add the requisite quantity of the carefully well mixed sample to make the particular dilution and fill with dilution water to 1 liter. Mix thoroughly but gently with a plunger type of rod without entraining air. Siphon the dilution into two glass-stopper bottles, fill completely and stopper. Prepare succeeding dilutions of lower concentrations in the same manner.
- Determine the initial dissolved oxygen concentration in one of the two bottles of each dilution. Water seal the other bottles and incubate at 20 Deg.C. for 5 days. At the same time, siphon the dilution water alone into two glass-stopper bottles and determine the blank in one and incubate the other at 20 Deg.C, for 5 days. After incubation for 5 days, determine the dissolved oxygen in the dilutions and the blank in the same manner as the initial dissolved oxygen content.

### Calculation

Biochemical oxygen demand (5 days at 20 Deg'C.), mg/l =  $\{(D1 - D2) - (C1 - C2) F\} / P$  Where

D1 = Initial dissolved oxygen content of the diluted sample,

D2 = Dissolved oxygen content of the diluted sample after incubation. C1 = Initial dissolved oxygen content of the seeded dilution water,

C2 = Dissolved oxygen content of the seeded dilution water after incubation,

F = ratio of the seed in the sample to that in the control, that is, percent seed in D1 divided by percent seed in C1, and

P = Decimal fraction of the sample used.

### **Chemical Oxygen Demand (COD) Outline of the Method**

This is determined by refluxing the sample with an excess of potassium dichromate in acid conditions and estimating by titration the amount of dichromate consumed.

### **Interference**

Unstable samples should be tested without delay and samples containing settleable solids should be homogenized by suitable means for ease of representative sampling. Initial dilutions in volumetric flasks should be made on those samples having a high COD, in order to reduce the error which is inherent in measuring small sample volumes. Chlorides are quantitatively oxidized by this procedure when silver sulphate is not used as a catalyst. In this case, a correction should be applied by determining chlorides on a separate sample and subtracting the calculated oxygen demand of the chlorides from the result. Since 1 mg/l of chloride will consume 0.23 mg/l of oxygen, the correction is mg/l of chloride x 0.23

### **Reagents Required**

Standard Potassium Dichromate Solution - 0.25 N. Concentrated Sulphuric Acid.

Standard Ferrous Ammonium Sulphate Solution - 0.25 N. The solution shall be standardized daily against standard potassium dichromate solution.

Ferriin Indicator Solution - Dissolve 0.485 g of 1, 10 phenanthroline

(monohydrate), together with 0.695g of ferrous sulphate (FeSO<sub>4</sub> - 7H<sub>2</sub>O) in distilled water and dilute to 100 ml.

Silver Sulphate Mercuric Sulphate

### **Test procedure**

Place a 50ml sample, or an aliquot diluted to 50 ml with distilled water, in a 300 - ml round- bottom flask fitted with ground-glass joint for attaching a condenser, and add 25 ml of standard potassium dichromate solution. Carefully add 75 ml of concentrated sulphuric acid, mixing after each addition.

### **Caution**

The mixture shall be thoroughly mixed before heat is applied. If this is not done, local heating occurs in the bottom of the flask and the mixture may be blown out. Attach the flask to the condenser and reflux the mixture for 2 hours. Pumice granules or glass beads should be added to the reflux mixture to prevent bumping. Cool and then wash down the condenser with about 25ml of distilled water. In many cases, the 2 hour reflux period is not necessary. Therefore, with particular samples, the reflux period of refluxing may be permissible. Transfer the contents to a 500 ml conical flask, washing out the reflux flask 4 to 5 times with distilled water. Dilute the mixture to about 350 ml and titrate the excess potassium dichromate with standard ferrous ammonium sulphate solution, using Ferriin indicator. Generally 2 to 3 drops of the indicator are used. The colour change is sharp, changing from the blue-green to a reddish-blue. The end point, however, will not be as sharp as in the standardization of the reagents because of the lower acid concentration. For this reason, it is necessary that the sample be diluted to at least 350 ml before the titration is carried out. A blank consisting of 50 ml of distilled water instead of the sample, together with the reagents, is refluxed in the same manner

### **Calculation**

Chemical oxygen demand, mg/l = ((A - B) N x 8000)/V Where,

A = volume in ml of ferrous ammonium sulphate solution used in the Titration in the blank.

B = volume in ml of ferrous ammonium sulphate solution used in the titration with the sample, N = normality of standard ferrous ammonium sulphate solution and,

V = Volume in ml of the sample taken for the test.

**Total Suspended Solids (TSS) Outline of the method**

Suspended matter is determined by filtering the sample through an asbestos pad in a Gooch crucible.

**Reagent Asbestos cream**

Make a cream of acid-washed medium-fiber Gooch asbestos with water. Add one liter of water for every 15 g of asbestos. If the asbestos contains too much fine powder, remove the latter by repeated decantation.

**Procedure**

Make carefully asbestos mat in the Gooch crucible by adding sufficient asbestos cream to produce a mat about 3mm thick. In preparing the mat, first fill the crucible with well-mixed asbestos cream, let stand for about two minutes to allow the heavier particles to settle and then apply suction to the same extent as will be used for filtering the sample. Wash the mat with water with the suction on by filling and drawing through. Dry the crucible with the asbestos mat in an oven at 103 Deg °C. to 105 Deg °C. For one hour, cool in desiccators and weigh. Filter the sample through the weighed Gooch crucible after moistening with a few drops of water. Add successive increments of 10 ml of the well-shaken sample for filtration using suction. Add each increment of sample before the mat becomes dry. The use of a pipette with an orifice wide enough to prevent clogging with suspended matter is recommended. Continue successive 10ml additions of the sample until the filtration becomes inconveniently slow or until about 10 to 20 mg of suspended matter has been filtered. Carefully wash the mat with 10ml of water to remove soluble salts.

Continue suction until draining is complete. Dry the crucible in an oven at 103 Deg °C. to 105 Deg °C. For one hour, cool to room temperature in desiccators and weigh.

**Calculation**

Total suspended solids, mg/l = 1000 w/V

**Total Dissolved Solids (TDS)**

A well-mixed filtered sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105 Deg. C. The increase in weight over that of the empty dish represents the total residue.

**Apparatus**

1. Silica or porcelain dish of 100 ml capacity
2. Desiccators
3. Oven

**Procedure**

Ignite the clean evaporating dish at 550 + 50 Deg. C for 1 hour. Cool, desiccate and weight. Transfer the measured sample to the pre weighed dish and evaporate to dryness on a steam bath. Choose a sample volume that will yield a minimum residue of 25 mg to 250 mg.

If necessary, add successive portions of sample to the same dish. Dry the evaporated sample for at least 1 hour at 103 to 105 Deg. C. Cool the dish in desiccators and weigh. Repeat the cycle of drying, cooling and weighing until a constant weight is obtained.

**Calculations**

Total dissolved solids, mg/liter = wt of residue x 1000 ml. Of sample taken

**Fecal Coliforms**

Fecal coliform bacteria are found in the feces of humans and other warm-blooded animals. These bacteria can enter rivers directly or from agricultural and storm runoff carrying wastes from birds and mammals and from human sewage discharged into the water.

**Pathogenic organisms**

include bacteria, viruses and parasites that cause diseases and illnesses. Fecal coliform bacteria naturally occur in the human digestive tract, and aid in the digestion of food. In infected individuals, pathogenic organisms are found along with fecal coli form bacteria. If fecal coli form counts are high (over 200 colonies/100 ml of water sample) in the river, there is a greater chance that pathogenic organisms are also present. A person swimming in such waters has a greater chance of getting sick from swallowing disease-causing organisms, or from pathogens entering the body through cuts in the skin, the nose, mouth, or the ears. Diseases and illness such as typhoid fever, hepatitis, and gastroenteritis, dysentery, and ear infections can be contracted in waters with high fecal coli form counts. Pathogens are relatively scarce in water, making them difficult and time-consuming to monitor directly. Instead, fecal coli form levels are monitored, because of the correlation between fecal coli form counts and the probability of contracting a disease from the water.

**Sampling Procedures**

1. Remove the stopper or cap just before sampling and avoid touching the inside of the cap.
2. If sampling by hand, use gloves and hold the bottle near its base. Plunge it (opening downward) below the water surface, then turn the bottle underwater into the current and away from you.
3. Avoid sampling the water surface because the surface film often contains greater numbers of fecal coli form bacteria than is representative.
4. Also, avoid sampling the sediments for the same reason, unless this is intended. The same general sampling procedures apply when using the extended rodsampler.
5. When collecting samples, leave some space in the sample container (an inch or so) to allow mixing of the sample before-pipetting. It is a good idea to collect several samples from any single location to minimize the variability that comes with sampling for bacteria. If possible, sterilization should occur between sampling sites. *Ideally, all samples should be tested within one hour of collection. If this is not possible, the sample bottles should be placed in ice and tested within six hours.*

Two general types of analyses are possible to enumerate fecal coli forms:

1. MPN - Most Probable Number
2. Membrane Filter - MF

The MPN method attempts, by serial dilution, to introduce one, and only one, bacteria into a fermentation tube containing media for the bacteria to thrive on. By observing gas production or the lack of gas production, it is possible to determine the probable number of bacteria originally present in the sample. In performing the analysis, it is necessary to have five tubes each of at least three decimal dilutions. The goal of the dilution scheme is to have some tubes positive with gas production and some tubes negative or no gas production. The purity of the water under study with experience will determine the decimal dilutions to be used. Dilution of 1, 0.1, and 0.01 ml can be used successfully for a wastewater treatment plant effluent which is within the 200 coli form/100 ml discharge limit for chlorinated effluents.

**Most Probable Number (MPN) Index**

By examining different volumes of sample, one-tenth multiples of 1 ml, it is possible to make an approximate estimate of the number of coli form bacteria present in the sample through consideration of the relative numbers of tubes in the various dilutions which yield positive and negative results. The estimation is in the form of a "most probable number index" which essentially is a concentration of coli form bacteria in the sample (expressed as the number of bacteria per 100 ml of sample) which would most probably yield the same combination of positive and negative tubes as obtained in the examination of the sample. For convenience in calculating, the most probable number index table has been prepared. When more than 3 dilutions in a decimal series are examined, the results from only 3 of them are significant. The highest



are selected. The results of these 3 dilutions are then used in computing the MPN index. The calculated index will equal the tabular index multiplied by a factor equal to the denominator of the highest dilution giving positive results in all 5 tubes. For example, if all tubes in all dilutions are positive until the 1/1000 dilution is reached, we consider only the 1/1000 and 1/10,000 dilutions as significant. Suppose the results of analysis indicate that the positive tubes for these 3 dilutions are as follows:

1/100 5+ 0-

1/1000 4+ 1-

1/10,000 3+ 2-

The MPN index then equals  $280 \times 1000 = 280,000$  coli form bacteria in 100 ml of the original.

### Membrane Filter

The membrane filter technique (MF) is the second method used for the enumeration of fecal coliforms. The membrane filter technique involves passing a portion of sample through a membrane filter. The filter process is designed in such a way as to retain coli form bacteria present in the sample. The entire filter with the retained bacteria is placed on a specially prepared media contained in a petri dish. The petri dish and its content are next incubated for 24 hours at 44.5°C. At the end of the incubation period, the filter is examined with a 10 - 15X stereoscopic or some other optical device. All blue colored colonies on the filter are counted. Each blue colored colony is assumed to be the result of one fecal coli form originally in the sample. From the colony counting procedure and knowing the sample volume filtered, it is possible to calculate the number of fecal coli form/ 100 ml present in the original sample. In comparing the MPN and the Membrane Filter technique it must be remembered that:

1. The MPN is an estimate of the number of fecal coli forms originally presenting the sample while the MF technique results in an exact count.
2. Most of the equipment and supplies needed for the MF technique are available sterile and ready for use from a number of commercial companies.
3. The techniques used in the MF procedure are considered more easily mastered than those used in the MPN.
4. The MF technique has been found to yield low and variable recoveries on samples of chlorinated wastewater when compared to the MPN technique.

Either the MPN or the MF technique can be used for self-monitoring of a wastewater treatment plant effluent; however, the EPA, in promulgating the methods to be used notes "...the MPN will be required to resolve any controversies." In the majority of cases the MF technique will more than satisfy the self-monitoring requirements now in existence with the MPN method being the required method only in unusual circumstances. Samples used for fecal and total coli form analysis should be grab samples collected in sterile containers. The sample must be chilled and the analysis begun within one hour of collection time. The sample must also be dechlorinated at the time of collection.

## GUIDELINES TO FILL LOG SHEET

1. The Log sheet should be filled up once in every hours.
2. Inlet Flow to be measured by bucket method at the outlet of Equalization tank and pressure to be set at Feed Pump discharge
3. Air Blower changeover to be done once in Shift, Oil level of Blower to be checked and changed if required.
4. Air blower suction filter to be cleaned once in a week.
5. Under the columns Air to Equi- Tank, Air to Bio Reactor mention 'OK' or 'NOT OK' by seeing visually the air distribution in the respective zones and measuring air to reactors.

## Annexure-VIII Inventory

<b>Inventory of Sewerage Treatment Plant</b>
Given in attached O&M manual
<b>Inventory of Inlet tank, pump room, outgoing tank for residential complex</b>
1. Johnson make 3HP Self-priming non clog pump with D.O.L. starter– 02 nos.
2. Inlet tank & outlet tank
<b>Inventory of water softening system</b>
1. Water softening system comprising M.S. fabricated vertical softener 1800 mm dia. (approx.) and 1800 mm HOS with 8 mm, and 10 mm thickness at dished ends and shell, internal rubberized lining with M.S. rubber lined brine tank of suitable for two regeneration liter capacity with motorized agitator, 65 mm dia. face piping, CI butterfly valves, pressure gauge, hydraulic brine injector, accessories, painting inside with epoxy paint and outside with two coat of red oxide primer and two or more coat of synthetic enamel paint, testing and commissioning complete with resins. Capacity 75000 lph.
2. Providing and fixing rubber lined M.S. tank for salt mixing and brine saturation capacity of 2regeneration as per manufacture's design for main softener.
<b>Inventory of Effluent Treatment Tanks</b>
1. Effluent Treatment Tanks 02 nos. as per drawing attached.

**Check List for Documents Required with Technical Bid****(To be attached with the Technical Bid)**

<b>S. No.</b>	<b>Detail provided</b>	<b>Compliance (to be ticked as attached)</b>	<b>Page no. of bid</b>
1.	Criteria of eligibility:	Yes / No	
2.	Copy of constitution or legal status of the bidder manufacturer / Sole proprietorship / firm / agency etc	Yes / No	
3.	Copy of Income Tax Return Acknowledgement for last Three years	Yes / No	
4.	Copy of PAN Card Registration	Yes / No	
5.	Copy of GST registration certificate.	Yes / No	
6.	Acceptance of tender	Yes / No	
7.	General Conditions of Contract	Yes / No	
8.	Special Conditions of Contract	Yes / No	
9.	Scope of Work Read, examine and accepted	Yes / No	
10.	Annexure – I (Technical Bid)	Yes / No	
11.	Annexure – II (Undertaking)	Yes / No	
12.	Annexure – III (Details of all works of similar)	Yes / No	
13.	Annexure – V (Performance of Earnest Money)	Yes / No	
14.	Annexure – VI (Operation & Maintenance Manual) Read, examine and accepted	Yes / No	
15.	Annexure – VII (Inventory) Read, examine and accepted	Yes / No	
16.	All required documents are duly signed, sealed and numbered	Yes / No	

Date:  
Place:

Name :  
Business Address:  
Signature of Bidder:  
Seal of the Bidder:

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LIST OF CIVIL UNITS

TAG. NO.	DESCRIPTION	SIZE/CAP.	QTY.
T-1010	COARSE BAR SCREEN	0.8 x 1.8 x 0.8M SWD	1NO.
T-1020	OIL & GREASE TRAP	5.45x 1.8 x 1.8M SWD	1NO.
T-1030	EQUALIZATION TANK	9.4 x 6.5 x 3.5M SWD	1NO.
T-1040A	FINE BAR SCREEN-AUTO	1.0 x 1.0 x 0.5M SWD	1NO.
T-1040B	FINE BAR SCREEN-MANUAL	1.0 x 1.0 x 0.5M SWD	1NO.
T-1050	ANOXIC TANK	4.4 x 4.4 x 3.7M SWD	1NO.
T-1060	BIO REACTOR	8.1 x10.0 x 3.5M SWD	1NO.
T-1070	MEMBRANE TANK (GE MEM)	3.1 x 4.4 x 3.0M SWD	1NO.
T-1090	PERMEATE TANK	4.4 x 4.4 x 3.0M SWD	1NO.
T-1100	SLUDGE HOLDING TANK	2.95x 2.6 x 3.0M SWD	1NO.
-	SPACE FOR CENTRIFUGE	SUITABLE	1NO.

MECHANICAL UNIT DETAIL FOR 850M3/DAY (MBR)

Sr. NO.	DESCRIPTION	MARK	SIZE / CAPACITY	NOS. OFF.
1	BAR SCREEN 6MM	BS-1010	TL STD.	1 NO
2	SLOTTED PIPE OIL SKUMMER	OS-1020	TL STD.	1 NO
3	AIR GRID - EQUALISATION TANK	ADG-1030	TL STD.	1 LOT
4	DIFFUSER	-	TL STD.	1 LOT
5	BIO REACTOR FEED PUMPS	P-1011/12	35.5M3/HR@12MWC	2 NOS
6	FINE SCREEN (AUTO) 2MM	BS-1040A	TL STD.	1 NO
7	FINE SCREEN (MANUAL) 2MM	BS-1040B	TL STD.	1 NO
8	AIR BLOWER FOR EDT, SHT & BIO REACT.	AB-1011/12	650M3/HR@5400MMWC	2 NOS
9	AIR BLOWER FOR MEMBRANE	AB-1013/14	450M3/HR@4000MMWC	2 NOS
10	AGITATOR FOR ANOXIC TANK	AG-1050	SUITABLE	1 NO
11	AIR GRID FOR - BIореACTOR	ADG-1060	TL STD.	1 LOT
12	DIFFUSER	-	TL STD.	1 LOT
13	MEMBRANE	MEM-1070	SUITABLE	1 LOT
14	MEMBRANE SKID	-	SUITABLE	1 NO
15	SLUDGE RECIRCULATION PUMPS	P-1021/22	142M3/HR@10MWC	2 NOS
16	PERMEATE PUMPS CUM BIOGAS PUMPS WITH VFD	P-1031/32	38-45M3/HR@10MWC	2 NOS
17	HYPLO DOSING TANK	T-1080	150 LITS	1 NO
18	UV SYSTEMS	UV-1010	6 LPH	1 NO
19	UV GRID SLUDGE HOLDING TANK	ADG-1100	SUITABLE FOR 36M3/HR	1 NO
20	DIFFUSER	-	TL STD.	1 LOT
21	CENTRIFUGE FEED PUMPS	P-1041/42	5.0M3/HR@14 MWC	2 NOS
22	CENTRIFUGE (BATCH TYPE)	CF-1010	45KG PER BATCH SOLID HANDLING CAPA.	1 NO
23	DWPE DOSING TANK	T-1130	300 LITS	1 NO
24	DWPE DOSING PUMP	P-1130	0-50 LPH	1 NO
25	AGITATOR FOR DWPE DOSING TANK	AG-1130	SUITABLE	1 NO
26	AIR COMPRESSOR WITH DRYER	COMP-1010	2 CFM,70MWC	1 NO
27	HYPLO DOSING TANK FOR MAINTENANCE	T-1110	300 LITS	1 NO
28	HYPLO DOSING PUMP FOR MAINTENANCE	P-1110	150 LPH@2BAR	1 NO
29	CITRIC DOSING TANK FOR MAINTENANCE	T-1120	300 LITS	1 NO
30	CITRIC DOSING PUMP FOR MAINTENANCE	P-1120	150 LPH@2BAR	1 NO

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IN DOBBY PLEASE ASK.

VALVE LEGEND

PC - ONE WAY

DC - TWO WAY

RT - NON RETURN

BT - BATTERY

PN - PNEUMATIC

MT - MECHANICAL

RAW & CHARAL

PARAMETS

CAP.

PH

BOI

LOD

TSB

DSB

TURBIDITY

PH

COLLUMN

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REV	DATE	DESCRIPTION	BY	CHKD	APPD
1	10.10.13	ISSUED FOR WORK			
2	10.10.13	REVISED AS MARKED			
3	10.10.13	REVISED AS MARKED			
4	10.10.13	REVISED AS MARKED			
5	10.10.13	REVISED AS MARKED			
6	10.10.13	REVISED AS MARKED			
7	10.10.13	REVISED AS MARKED			
8	10.10.13	REVISED AS MARKED			
9	10.10.13	REVISED AS MARKED			
10	10.10.13	REVISED AS MARKED			

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